U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-261 518

NAPCA Abstract Bulletin Volume 1, Number 10, 1970 Abstracts 7328-8463

Air Pollution Technical Info. Ctr., Research Triangle Park, N.C.

1970

365054

VOLUME 1, No. 10
Abstracts 7328—8463

PB 261 518

NASA Abstract Bulletin

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service

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NATIONAL TECHNICAL
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SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
APABCA- 1-10-1970		

4. TITLE AND SUBTITLE	5. REPORT DATE
Air Pollution Abstracts Volume 1, No. 10	, 1970
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Pollution Technical Information Center Research Triangle Park, North Carolina 27711	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Same	13. TYPE OF REPORT AND PERIOD COVERED
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

Spine bears title. Errata for indexes is included

16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 7328 - 8463.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Abstracts Information retrieval		13B 5B

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Unlimited		308
	20. SECURITY CLASS (This page)	22. PRICE 9.75

EPA Form 2220-1 (9-73)

ERRATA

NAPCA Abstract Bulletin, Volume 1, No. 10 (previously distributed)*

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7330	refer to 7902
7331	refer to 7724
7332	refer to 7764
7333 through 7351	subtract five (5)
7352 through 7481	subtract four (4)
7482 through 7726	subtract three (3)
7727 through 7765	subtract two (2)
7766 through 7902	subtract one (1)

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NAPCA ABSTRACT BULLETIN

Prepared and Distributed by:

Office of Technical Information and Publications (OTIP)
Air Pollution Technical Information Center (APTIC)
National Air Pollution Control Administration (NAPCA)
1033 Wade Avenue
Raleigh, North Carolina 27605

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U. S. Department of Health, Education, and Welfare
Public Health Service
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TABLE OF CONTENTS

The categories used to organize the "NAPCA ABSTRACT BULLETIN" have been changed slightly to permit more effective use. Scope notes for each category are given as a guide to our readers.

page

EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc. 1

CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants from the air. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles. 19

MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories. 101

AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories. 151

page

ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions fall under Basic Sciences and Technologies. 159

BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes atmospheric photochemical studies and biochemical studies related to effects of air pollution. 181

EFFECTS-HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments. 209

EFFECTS–PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals. 231

EFFECTS–MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures. 241

ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general. 245

STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels. 251

page

LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions. 255

SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information. 265

GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories. 267

SUBJECT INDEX..... 273

AUTHOR INDEX..... 285

ORDER FORM..... 305

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7328 APTIC NUMBER 19131

Akkerberg, I. I., E. A. Blinova, A. M. Vidomenko, J. A. Yurgenson, and Kh. Ya. Yanes
HYGIENIC ASSESSMENT OF AIR POLLUTION IN A DISTRICT WITH COMBUSTIBLE SHALE INDUSTRY. (Gigiyenicheskaya otsenka zagryazneniya atmosfernogo vozdukha v rayone predpriyatiy slantsevoy promyshlennosti). Text in Russian. Gigiena i. Sanit., 25(8):5-7, Aug. 1960.

The main pollutant of the atmosphere in districts with combustible shale processing plants is sulfur dioxide, the presence of which is detected all year round at high concentrations up to a distance of 3 km from the site of its discharge. In cold and transient seasons of the year, the level of SO2 ithe air is much higher than during warm summer months; the reason for this may, in a certain measure, be ascribed to an additional discharge of SO2 as a result of heating dwelling houses with shale. The pollution of the atmospheric air with carbon monoxide is of much lesser importance, since its average one-time content does not exceed the maximum permissible concentration. The content of dust in the air is high. It is suggested that the width of the sanitary protection zone around combustible shale processing plants be increased to 3 km as opposed to the 1 km required by the N-101-54 regulations. (Author summary modified)

7329 APTIC NUMBER 19362

American Foundrymen's Society, Des Plaines, Ill.
INTRODUCTION. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 1, p. 1-3.

The problem of air pollution, its adverse effects, and aspects of control are briefly discussed in general terms. The major air pollution problem from most foundries arises from their metal melting processes, and foundry emissions consist mainly of oxides and silicates in the form of relatively coarse cinders and dust. Such emissions are considered a nuisance from settling rather than a health hazard. Control equipment for foundry applications is readily available, and collecting devices for pollution from grinding, cleaning, shakeouts and material handling have been in use by foundries for many years. Foundry operators should keep informed of air pollution regulations and attitudes in their respective communities, conforming in the most economic and effective way possible.

7330 APTIC NUMBER 19363

American Foundrymen's Society, Des Plaines, Ill.
STATEMENT OF THE PROBLEM. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 2, p. 4-14.

Each major branch of the foundry industry - gray iron, nonferrous, malleable, and steel founding - has pollution problems peculiar to it as well as certain common difficulties. Foundry emissions are described tabularly, while pollutant sources are classified as: effluents from dust-producing operations, for which almost all foundries routinely employ some type of dust-collecting equipment; odors and gaseous compounds, most commonly from corebaking ovens; and effluents from ferrous and nonferrous furnaces. Pollutants from cupola effluent gases are described in detail and present the most complex and high-cost control problems, although there are also emissions from electric melting and duplexing furnaces, air furnaces, and open hearth furnaces. Effluents from nonferrous operations on such metals as brass, bronze, copper, aluminum, and magnesium alloys, about which less is known, are discussed. Serious air pollution exists from alloys of copper with beryllium, which is extremely toxic and requires the most efficient gas-cleaning equipment. Techniques and economics of control are discussed. The cost of dust cleaning equipment is a function of the gas volume handled, quantity and size of particulates, and temperature-corrosion considerations.

7331 APTIC NUMBER 21752

Athanassiadis, Yanis C.
PRELIMINARY AIR POLLUTION SURVEY OF CADMIUM AND ITS COMPOUNDS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div. Contract PH 22-68-25, NAPCA Pub.-APTD 69-32, 81p., Oct. 1969. 168 refs.
CPSTI: PB 188086

The effects, sources, abatement, and methods of analysis for pollution due to cadmium and its compounds are reviewed, as average ambient air concentration was 0.002 micrograms/cu m in 1964. Major emission sources are the metal industries engaged in extraction, refining, machining, electroplating, and welding of cadmium materials. Since cadmium is produced as a by-product rather than as a primary product, the refining of associated metals, such as zinc, lead, and copper, provides the emission sources important to air pollution. Cadmium is also used in the manufacture of pesticides and fertilizers. It is known to be toxic to practically all systems and functions of human and animal organisms, and it is absorbed without regard to the level of existing concentrations in the body, indicating the lack of a homeostatic mechanism for the control of cadmium levels. When inhaled, cadmium and its compounds can produce pulmonary emphysema and bronchitis, kidney damage resulting in proteinuria, and gastric and intenstinal disorders. Atmospheric concentrations have been related statistically to diseases of the heart. Animal experiments also indicate that cadmium may be carcinogenic. The impinger, electrostatic precipitator, and filter are commonly used to collect the dust and fumes of cadmium compounds, while emission spectroscopy, polarographic, and colorimetric methods provide quantitative determinations. No information was found on methods of abatement peculiar to air pollution by cadmium, but general control procedures for the prevention of air pollution by dusts, fumes, and mists applicable to the metal refinery, alloying, and machining industries are considered suitable to these processes in the cadmium industry. (Author abstract modified)

7332 APTIC NUMBER 21999

Athanassiadis, Yanis C.
PRELIMINARY AIR POLLUTION SURVEY OF VANADIUM AND ITS COMPOUNDS.

A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-48, 91p., Oct. 1969. 104 refs.
CFSTI: PB 188093

The effects, sources, abatement, and methods of analysis for pollution due to vanadium compounds are discussed, as the average levels noted ranged from below detection (0.003 micrograms/cu m) to 0.30 (1964), 0.39 (1966), and 0.90 (1967) micrograms/cu m. Major sources are the vanadium refining industries, alloy industries, and power plants and utilities using vanadium-rich residual oils. One report on abatement indicated that an economic gain resulted from extracting vanadium from steam generators using vanadium-rich fuel. The methods of quantitative analysis of vanadium in the atmosphere that are available, including colorimetric, atomic absorption spectroscopy, emission spectrography, and polarography, provide sensitivities in the 0.001 microgram/cu m range. Vanadium is toxic to humans and animals, especially in its pentavalent form. Human exposure through inhalation of relatively low concentrations (less than 1,000 micrograms/cu m) has resulted in inhibition of cholesterol synthesis, and chronic exposure to environmental air containing vanadium has been statistically related to mortality rates from heart diseases and certain cancers. Exposure to high concentrations results in physiologically observable effects of varying severity on the gastrointestinal and respiratory tracts. Vanadium in fuels was found to be corrosive to heating plants.

7333 APTIC NUMBER 21888

Bernert, J.
EXPERIMENTS CONCERNING ODOR ELIMINATION AT FOOD OPERATIONS. (Versuche ueber Geruchsbeseitigung in der Lebensmittelproduktion). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:303-312, 1970. 20 refs.

The efficiency of waste gas cleaning systems at various food operations was determined by a silica gel method. Treatment in a flame afterburner of the waste gases developing during hot-curing of meat reduced the C-content from a maximum of more than 300 mg/cu Nm to 150 mg/cu Nm. At the cold-smoking process, C-concentrations of less than 100 mg/cu Nm were achieved. Efficiencies as high as 97% were achieved with a combination of flame afterburners and cyclones in the production of malt and separation of husks at a brewery. Pressure jump condensers installed in beer breweries were found to precipitate 32.5% of the condensate and 36.5% of the C-content after a temperature drop of 3.8 C (from 88.8 C to 85 C). It is indicated that greater temperature drops would bring even better efficiencies. At a protein dissociation phase in spice production plants, microorganisms are used for biologic decomposition of the harmful and/or odorous gaseous components. The efficiency of this cleaning method was found to reach 75.7%, but the above method was not suitable for determining the efficiency of an air filter installed in a meat canning plant. It is estimated, however, that their efficiency amounts to about 80%.

7334 APTIC NUMBER 21886

Brocke, W.
SOOT SEPARATION AT OIL FIRED FURNACES. (Russabscheidung bei Oelfeuerungen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:279-285, 1970. 19 refs.

Fuel oil consumption in the Federal Republic of Germany increased from 17.9 million tons in 1965 to 21.4 million tons in 1968, with the power plants alone accounting for about 25% of this amount. A heavy fuel oil-fired boiler emits between 0.23 to 8 kg dust/ton of oil. During normal operation the dust contains 90 to 95% of combustible matter, during soot blowing 75 to 93%. Dust concentrations between 15 and 400 mg/cu Nm could be measured in the waste gas during normal operation, and between 1000 and 10,000 mg/cu Nm during soot blowing. The gas contained 12% by weight sulfuric acid. Of the dust particles, 80% had diameters of less than 20 microns, with 20 to 30% having diameters less than 5 microns. Dust emission measurements taken at four oil-fired boilers (16 to 20 tons/h) revealed that centrifugal separators reduced the emissions from between 46 to 55 mg/cu Nm to between 24 and 40 mg/cu Nm during normal operation, and from 1050 to 1870 mg/cu Nm to between 104 and 174 mg/cu Nm during soot blowing. Better results can be achieved with electrostatic precipitators, but they are considerably more expensive.

7335 APTIC NUMBER 21916

Cember, Herman, Richard W. Smith, and Mary Jane Oestmann
AN ESTIMATE OF THE INHALATION HAZARD FROM NEUTRON-ACTIVATED CONCRETE DUST. Am. Ind. Hyg. Assoc. J., 31(3):327-330, May-June 1970. 12 refs.

An evaluation was made of the radiological health hazard arising from inhalation of radioactive concrete dust, from a barytes aggregate concrete used for nuclear reactor shielding. This study involved (1) generation of airborne concrete dust particulates; (2) thermal neutron irradiation of the dust samples; and (3) measurement of the induced radioactivity samples. Inhalation of airborne activated concrete dust for several hours, at concentrations that may be encountered in practice, may be hazardous by ICRP occupational safety criteria, unless appropriate action is taken to reduce exposure. For example, exposure, after 13 days of cooling, for 8 hours in a concentration of 9 1/4 mg/cu m would lead to a 13-week radiation absorbed dose of 3900 mrads, which is the maximum permissible concentration according to the ICRP criterion. On the other hand, waiting 31 days after reactor shutdown, the worker would have to be exposed to a concentration of 27 1/2 mg/cum m for 8 hours before exceeding the ICRP recommendation.

7336 APTIC NUMBER 20104

Daniel, W. A.
ENGINE VARIABLE EFFECTS ON EXHAUST HYDROCARBON COMPOSITION (A SINGLE-CYLINDER ENGINE STUDY WITH PROPANE AS THE FUEL). SAE (Soc. Automotive Engrs.) Trans., 76(1):774-795, 1968. 22 refs. (Paper 670124.)

A laboratory single-cylinder engine operating on propane and at steady-state conditions was used to investigate the mechanism of individual hydrocarbon emissions and the effects of engine variables on the individual hydrocarbon concentrations in the exhaust. The basic speed and air flow conditions studied approximated the average conditions encountered during a 15-30 mph acceleration in 12.5 sec. Five air-fuel ratio, ignition timing combinations were used in both emission mechanism and engine variable experiments. Individual hydrocarbon concentrations from the engine combustion chamber or exhaust system were determined with on-line chromatography. The results indicate that a source of each of the individual hydrocarbons in the exhaust is the reaction (or lack of reaction) which occurs near the combustion chamber wall at the instant the flame is quenched or immediately afterwards. Another source of non-fuel exhaust hydrocarbons is probably the cracking of the propane in the combustion chamber after flame passage or in the exhaust pipe. The relative proportions of fuel and non-fuel exhaust hydrocarbons were very sensitive to engine operating conditions. Total hydrocarbon concentration changes resulting from engine variable changes did not necessarily reflect the amount or direction of the actual change in the smog-forming tendency of the exhaust gas. The significant interactions that were found among engine variables are qualitatively explained on the basis of the mechanism proposed for exhaust hydrocarbon emission. This mechanism assumes that the amount of propane left as the flame propagates through the chamber is probably a minimum near stoichiometry; the amount of cracking of the propane in either the chamber or the exhaust is probably a maximum on the rich side of stoichiometry; and the amount of oxidation is probably a maximum on the lean side of stoichiometry.

7337 APTIC NUMBER 19149

Dikun, P. P.
THE PRESENCE OF 3,4 BENZPYRENE IN INDOOR AIR. Probl. Oncol. (USSR) (English translation from Russian of: Vopr. Onkol), 6(2):257-259, Feb. 1960. 1 ref.

Results are presented of a study to determine the 3,4-benzpyrene content of several samples of dust collected in three apartments in different areas of Leningrad. Three samples took the form of dust collected by a vacuum cleaner from the floors (freely-spread, sedimentary dust) and the fourth sample was taken from the ventilation grill (an aspirational sample) in the kitchen. The dust was collected in the winter and spring before the windows were opened. As determined by fluorescent-spectral analysis, 3,4-benzpyrene was present in all samples. The 3,4-benzpyrene content of the sedimentary samples did not differ greatly from that suspended in the air. Room dust contains about 10 times less of the carcinogenic substance than outdoor air. Since the flats had no interior sources of 3,4-benzpyrene (the gas burners in the kitchens could not account for the results obtained), the experiments prove that 3,4-benzpyrene penetrates into closed buildings from the external environment. (Author abstract modified)

7338 APTIC NUMBER 17631

Endo, Ryosaku, Tetsutaro Kogo, Tatsunori Oyake, and Hiroshi Hirakawa
OFFENSIVE ODORS. 10. INVESTIGATION OF THE EXISTING CONDITIONS IN HOKKAIDO WITH RESPECT TO OFFENSIVE ODORS (SECOND REPORT). CHEMICAL ANALYSIS OF THE COMPONENTS OF THE ODORS. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 4p.

An investigation of offensive odor constituents by chemical analysis was conducted at various marine processing plants. The waste gases from the exsiccation flue and vapor from the steam boiling process were collected and analyzed. The results were as follows: ammoniacal nitrogen, 4.13 g/l; volatile amino-nitrogen, 3.8 g/l; volatile organic acid, 19.53 g/l; hydrogen sulfide, 0.35 g/l; and mercaptans, 0.95 g/l. The concentrations perceived by the sense of smell were different than these for each constituent. If the average or maximum value of the volume of each constituent is evaluated from the offensive odor threshold concentration, volatile organic acid would be greatest in volume perceivable by smell. Second would be mercaptans, then H_2S, and ammonia which is actually the second most abundant. This may account for many of the difficulties involved in the evaluation of offensive odor components, their disposal, and countermeasures for them. In all cases, there was a relationship between freshness of materials and the degree of odor. The degree of freshness was especially low in the plants where mercaptans were abundant. Therefore, mercaptans may be regarded as an indicator in the method for evaluating offensive odors.

7339 APTIC NUMBER 19069

Fay, James A.
AIR POLLUTION FROM FUTURE GIANT JETPORTS. Massachusetts Institute of Tech., Cambridge, Fluid Mechanics Lab., Pub. 70-6, 11p., May 1970. 6 refs.

The planned expansion of major airports could lead to a new type of air pollution problem. These giant jetports will be capable of handling annually a hundred million passengers and more than a million aircraft operations. The pollutants emitted by aircraft during landing, taxiing, and take-off will cause higher ambient levels than is now encountered at existing airports. Because aircraft arrive and depart in a generally upwind direction, the pollutants are deposited in a narrow corridor extending downwind of the airport. Vertical mixing in the turbulent atmosphere will not dilute such a trail, since the pollutants are distributed vertically during the landing and take-off operations. As a consequence, airport pollution may persist twenty to forty miles downwind without much attenuation. Based on this simple meteorological model, calculations of the ambient levels of nitric oxide and particulates to be expected downwind of a giant jetport show them to be about equal to those in present urban environments. These calculations are based on measured emission rates from jet engines and estimates of aircraft performance and traffic for future jetports.

7340 APTIC NUMBER 19165

Felix, P.
INDUSTRIAL ELECTRO-HEAT APPLICATIONS AND AIR POLLUTION. (Les

applications electrothermiques industrielles et la pollution de l'air). Text in French. Preprint, Union Internationale de l'Electrothermie, Paris, 5p., 1966 (7).

Arguments for and against the increased use of electric heating in industry are discussed. The main objections are that many plants where electric heating and power are used still give off fumes, and that the power plants from which the electric power is derived are themselves sources of pollution. Concerning the first argument, it is pointed out that some plants, such as those for the making of aluminum and calcium carbide, cannot use other forms of power and can therefore not be compared. In cases where electric heating is one of several alternatives, the electric power does not in itself create pollution problems that do not exist when other heat sources are used. With respect to the problems of electric power plants, it is noted that substantial progress has been made in developing nuclear sources of power, reducing the sulfur content of fuel oil and coal, in providing higher chimneys for the dissemination of waste gases, in using recovery equipment for exhaust gases, and in locating power sources at greater distances from population centers.

7341 APTIC NUMBER 19128

Finkelstein, Harold
PRELIMINARY AIR POLLUTION SURVEY OF BIOLOGICAL AEROSOLS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-30, 94p., Oct. 1969. 129 refs.

The effects, sources, abatement, and methods of analysis of biological aerosols are reviewed, with emphasis on those that can be pathogenic for humans, animals, and plants and can cause damage to inanimate material. The microorganisms generally involved are bacteria, fungi (yeasts and molds), and viruses, which are essentially limited to indoor spaces or to closely confined outdoor spaces. They cannot reproduce in the air and usually do not survive long because of adverse conditions of humidity, temperature, and sunlight, with the exception of certain microorganisms that multiply saprophytically in the soil. Plants are susceptible to airborne pathogens that cause such diseases as wheat rust, potato blight, and almond brown rot; organic constituents of protective paint coatings and other inanimate surfaces are subject to microbial attack and damage. Several typical infections of humans include tuberculosis, pneumonia, the common cold, and influenza, while animals are affected by tuberculosis, hog cholera, and Newcastle disease. In addition, there is evidence that biological aerosols and nonbiological air pollutants may act synergistically to produce harmful effects. The source is most often the host organism that recently harbored the pathogens, although certain plant pathogens can have rapid and widespread aerial dispersal over hundreds of miles within a few days. Any count of microbial concentration in a given area is influenced by the temperature, meteorological conditions, vegetation, human and animal population, time of day, as well as by the inability to determine all types of microorganisms by any one sampling procedure. The abatement of some diseases, such as influenza, is of such complexity that some researchers believe that control will be dependent upon individual protection by immunization. Attempts have been made to control airborne infections indoors by the use of ultraviolet light, while the control of hospital-acquired infections has been directed toward the suppression of dust and use of disinfectants. Air-filtration devices are also available. Methods of analysis tend to be specialized according to atmospheric conditions, biological types, and particle size; procedures which have been used are sedimentation, impingement into liquids, impaction onto solid surfaces, filtration, centrifugation, and electrostatic and thermal precipitation.

7342 APTIC NUMBER 17634

Fujii, Toru
OFFENSIVE ODORS. 13. CONSTITUENTS OF, AND COUNTERMEASURES FOR, THE ODORIFEROUS FUMES FROM VINYL CHLORIDE 'LEATHER' FACTORIES. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 1p.

In vinyl chloride 'leather' manufacturing, a large amount of waste gas with an offensive odor is evolved in the effervescence treatment process. The constituents of the gas and a method for its disposal were investigated. When the gas was directly drawn off into distilled water, a decrease in the pH of the water was noted. The aqueous solution in which the gas has been absorbed contained NH4(+) and Cl(-). The eluate from extraction with benzene has a large amount of phthalic acid. These components were regarded as the substances which cause the offensive odor. They could be satisfactorily eliminated by using a venturi scrubber.

7343 APTIC NUMBER 21758

Gaskill, J. R., D. J. Hodgkins, and W. E. McMillen
SMOKE STUDIES ON SELECTED MATERIALS. In: Hazards Control Progress Report No. 15 September-December 1969. California Univ., Livermore, Lawrence Radiation Lab., p. 26-28, 35-36, 1969. 20 refs.
CFSTI: UCRL-50007-69-3

Samples of specialized protective coatings for wallboards and the like, cellulose foam insulating materials, and wall and ceiling finishes were evaluated from smoke development by exposing them to radiant heat with and without flame. Polyphenyline oxide-modified polyethelene coating did not smoke when exposed to heat alone. However, the smoke development of a coating system tended to be modified by the combustibility of its substrate: substrates coated with either polyester epoxide or epoxy polyamide systems developed more smoke under flaming conditions than during exposure to heat alone. Regardless of ventilation, the rigid organic cellular foam systems tested produced dense smoke rapidly when exposed to radiant heat; when a flame was present, smoke developed even more rapidly and to higher densities. The finishes varied widely in smoke development. Some decomposed slowly to yield light density smoke with negligible obscuration indices; others decomposed rapidly to obscure vision in less than half a

minute. The data confirm previous findings that materials which burn cleanly will yield relatively light smokes and that those which do not burn rapidly yield rapid, dense smokes.

7344 APTIC NUMBER 21827

Goldsmith, John R.
CONTRIBUTION OF MOTOR VEHICLE EXHAUST, INDUSTRY, AND CIGARETTE SMOKING TO COMMUNITY CO EXPOSURES. Preprint, New York Academy of Sciences, New York, 23p., 1970. 9 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Exposure to harmful levels of carbon monoxide is possible from cigarette smoking, from heating or cooking appliances in the household, from certain occupations, and from motor vehicle exhaust. These various forms of exposure can be contrasted by the number of people affected, the magnitude of exposure in relation to illness, and the time-course of exposure in relation to possible hazards. Exposure due to smoking is from practically no carboxyhemoglobin (COHb) up to 15% COHb. Roughly 40 to 60% of adults are affected. Occupational exposure from metallurgical industries, traffic control, and incomplete combustion processes can be fatal. The usual effect is an increase of less than 10% COHb. Household exposure can be extremely broad, from less than 2% to sufficient to cause fatality. The exposure is often over a number of hours, and the subject may be totally unaware of it. Exposure to motor vehicle exhausts affects millions daily. The usual intensity of exposure produces less than 2% COHb, but exceptional circumstances could lead to illness or death. Because of the nature of the uptake and excretion processes in the lung, the effects of multiple exposures are probably less than additive.

7345 APTIC NUMBER 19637

Grennard, Alf H.
LEAD ADDITIVES IN GASOLINE AND UNNECESSARY AUTOMOTIVE EXHAUST EMISSIONS. Preprint, 23p., 1969 (?).

Gasolines and the limited prospects of reducing the lead content with regard to the existing refinery pattern in Europe are discussed. It is not regarded as a promising prospect, since limitations of the lead content tend to increase the price of gasoline. Gasolines contain a number of poisonous materials including aromatics and organic lead compounds. Due to their vapor pressures, they evaporate when stored in open vessels such as gasoline tanks and carburetors. Closed fuel systems and devices for recovering gasoline vapors have been developed to solve these problems. Another method of controlling automotive emissions is by mechanically or electronically controlling the fuel injection. Improving the combustion chamber, reducing the carbon/hydrogen ratio of the fuel, and changing to gaseous fuels can also reduce poisonous emissions.

7346 APTIC NUMBER 21922

Haas, Jonathan M. and William W. Marsh, Jr.
SODIUM AZIDE: A POTENTIAL HAZARD WHEN USED TO ELIMINATE INTERFERENCES IN THE IODOMETRIC DETERMINATION OF SULFUR. Am. Ind. Hyg. Assoc. J., 31(3):318-321, May-June 1970. 10 refs.

In the high-temperature method for the determination of sulfur in petroleum products, sodium azide added to the titration cell solution eliminates nitrogen and/or chlorine interferences with the iodometric finish. In a laboratory in which sodium azide is used routinely for this purpose, some laboratory personnel working adjacent to the sulfur analyzer reported irritations such as nasal stuffiness. It was suspected that hydrazoic acid was being released from the titration cell, although the reportedly pungent odor of hydrazoic acid was not evident. Subsequent analysis showed hydrazoic acid being released from the titration cell at the rate of approximately 12 mg/min under the conditions for the automated titration of sulfur dioxide. It was estimated that hydrazoic acid vapors at a concentration as low as 0.5 ppm can cause some discomfort to laboratory personnel. The titration cell was subsequently placed within an exhaust hood. (Author abstract)

7347 APTIC NUMBER 21857

Hamanabe, Y., S. Harima, T. Miura, T. Domon, and T. Namiki
THE SENSITIVE MEASUREMENT OF BAD ODOR IN USING OF AN ODORLESS CHAMBER. (Mooshushitsoobob ni voloo shuki kannoh sokootei (II). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(3):135, 1969. 2 refs. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The odor of methyl-mercaptan, ammonia, and dimethyl sulfide was measured using an odorless chamber from whose windows odor was sniffed by a panel of 5-6 members on the threshold level, environmental level, and nuisance level of malodor. The first level means the minimum one, when the odor starts to smell; the second one does not give any actual effects on the body; and the last one results in headache, nausea, reduced appetite, etc. The results in ppm for threshold level, environmental level and nuisance level, respectively, are as follows: methyl mercaptan: 0.0001, 0.02, and 1.0; ammonia: 0.04, 8.0, and 40; and dimethyl sulfide: 0.01, 2.0, and 10. Although the comparison is made between these individual odors and mixed odors, it is difficult to know their relationship.

7348 APTIC NUMBER 21753

Harris, Robert L., Jr.
AIR POLLUTION PROBLEMS IN THIS SPACE AGE. Preprint, Kentucky Public Health Assoc., Louisville, 13p., 1970. (Presented at the Kentucky Public Health Association Meeting Louisville, April 2, 1970.)

Generation of air pollution is basically related to numbers of people and their utilization of energy. The world's present population is more than 3 1/2 billion, and the population doubling time is now less than 40 years. Use of engine powered vehicles, the generation and distribution of electrical power,

indeed the widespread use of fossil fuels, are primarily products of the past 100 years. Urban dwellers, now comprising about 70% of our population, are concentrated in about 1% of the nation's land area, and in an extreme case, the population density for residential land use of the most crowded census tract in Harlem is 895,000 people per square mile. In mid-town Manhattan, the vehicular pace of some 11.5 miles/hour in 1907 had been reduced to 6 miles/hour by the mid-1960's, and emissions per mile for motor vehicles increased substantially with decreasing average speed. Possible global effects of polluted air range from a melting of the polar ice caps with an attendant rise of some 200 feet in the level of the world's oceans to the reverse condition of a new ice age. In the Clean Air Act, as amended in 1967, the Congress has given the Nation a plan for taking a long-range view of the effects of a contaminated atmosphere, as well as a plan for coping to grips with the more obvious aspects of the problem.

7349 APTIC NUMBER 19498

Hashiguchi, K., K. Oda, I. Sugita, and S. Tanaka
STUDIES ON AUTO-EXHAUST GAS POLLUTION IN A ROAD INTERSECTION. (Shiguichi kohsaten ni okeloo jidohsha hai gas no jittai chohsa). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):94, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A preliminary investigation on the state of auto exhaust pollution at road intersections was conducted in Osaka to find out ways to control the concentrations of those gases (especially, carbon monoxide) below values of the established standards. The parameters measured were traffic volume (by photos and visual observation), the carbon monoxide concentration (by means of miler bags, automatic measurement and 'Fitagawa's detector tube'), and meteorological factors (temperature, humidity, wind direction and velocity). These were analyzed in terms of frequency distribution of the data and correlation between the data. The result of this investigation will be utilized as a basis of a pollution prevention system; no results are given for the study.

7350 APTIC NUMBER 20095

Hirao, Osamu
PROBLEMS OF AIR POLLUTION DUE TO VEHICLE EMISSION GASES. (Jidosha no haishutsu gasu niyoru taikiosen mitsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(1):37-41, Jan. 15, 1968. 6 refs.

If all automobiles had equipment to dispose of waste gases, contamination of the air would not occur. It is suggested that the money for such equipment should be invested in the construction of skew crossroads and high-speed highways instead. Not only would traffic congestion be relieved, but it is more effective for partial contamination. Today, people live longer than they did in the past when air pollution was not a problem. The fact that modern civilization, which brings harm to the environment, has given health and welfare to human beings should not be overlooked.

7351 APTIC NUMBER 21848

Huls, T. A. and H. A. Nickol
ENGINE VARIABLES INFLUENCE NITRIC OXIDE CONCENTRATION IN EXHAUST GAS. S.A.E. (Soc. Automot. Engrs.) J., Aug. 1968:40-44.

Based on tests of a 289 cu in. V-8 engine, with an aspirated carburetor and running on indolene fuel having 3 ml/gal of lead, it was determined that nitric oxide concentration in the exhaust gas of a multicylinder engine varies with air-fuel ratio, spark timing, and intake manifold pressures in a manner similar to a single-cylinder engine. Nitric oxide decreases with reduced coolant temperature and rises with increased deposit buildups. These results are consistent with the hypothesis that NO concentration in exhaust is primarily a function of peak combustion temperature and available oxygen. Results of the various tests are presented in 11 graphs, as NO concentrations were measured with either a mass spectrometer or a nondispersive infrared analyzer.

7352 APTIC NUMBER 21833

Jaffe, Louis S.
SOURCES, CHARACTERISTICS AND FATE OF ATMOSPHERIC CARBON MONOXIDE. Preprint, New York Academy of Sciences, New York, 19p., 1970. 67 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Carbon monoxide is the most abundant air pollutant found in the lower atmosphere, excluding carbon dioxide. Total emissions of CO in the U. S. are estimated to be 94 million tons. Fuel combustion by motor vehicles is the principle source; others are industrial processes, combustion processes, and natural sources. The CO concentrations in metropolitan areas are quite variable and localized, being dependent on human activity and meteorological factors. CO concentrations range from 1 to about 140 ppm; the latter level is present only as a brief peak in heavy traffic. With the mean residence time of atmospheric CO estimated to range from 0.1 year to about 5 years, the background levels should be rising about 0.08 ppm per year. Studies in Greenland indicate that the background level is not rising. Since the chemical oxidation of carbon monoxide to carbon dioxide in the lower atmosphere is very slow, it is possible that one or more removal processes or sinks for CO exist. Potential sinks discussed include upper atmospheric migration, biological metabolism by organisms, biochemical combination, and oceanic absorption.

7353 APTIC NUMBER 19017

Johnstone, H. F.
REACTIONS OF SULFUR COMPOUNDS IN BOILER FURNACES. Ind. Eng. Chem., 23(6):620-625, June 1931. 12 refs. (Presented at the American Chemical Society Meeting, 81st, Indianapolis, Ind., March 30-April 3, 1931.)

In a furnace, the sulfur in coal is converted mainly into sulfur dioxide. Only about 2% is oxidized to the trioxide, regardless of the temperature or oxygen content of the gases. The concentration of sulfur trioxide in the stack gases is no greater, therefore, than that in the furnace gases. Flue dust has only slight catalytic action in the oxidation of sulfur dioxide. When the sulfur in the fuel exists as sulfuric acid, as, for instance, in petroleum residues, about 85% of the acid is reduced in the furnace to sulfur dioxide. The gases contain only slightly more trioxide than those from high-sulfur coal. When coal is fired on a stoker, about 30% of the sulfur remains in the ash, at least a part of which exists as iron sulfide. Particles of dust containing the sulfide adhere readily to one another and to metal surfaces, so that hard deposits build up readily both on boiler and economizer tubes. On boiler tubes, most of the sulfur in the slag is lost by oxidation of the sulfides and decomposition of the sulfates. At lower temperatures, the sulfates are stable and the slag contains a large proportion of sulfate sulfur, even above the condensation temperatures of the gases. Concentrations of sulfur trioxide in the gases as low as 0.015% raise the dew point to 80-100 C. The hygroscopic nature of deposits containing ferric sulfate also causes moisture to condense at temperatures considerably above the dew point of the gases calculated from the partial pressure of water vapor in the gases. As solutions containing ferric sulfate act as strong catalysts for the oxidation of sulfur dioxide to sulfuric acid, the existence of these sulfates in the flue dust is responsible for an increase in the temperature range of corrosion by flue gases. Increased moisture content of the gases caused by leaks or by the use of steam soot-blowers will produce the same effect. (Author abstract)

7354 APTIC NUMBER 17745

Jotani, Fumio
COUNTERMEASURES OF AIR POLLUTION CAUSED BY EXHAUST OF MOTOR VEHICLES. (Jidosha haiki gasu ni yoru taiki osen no taisaku). Text in Japanese. Sekiyu Gakkai, Shi (J. Japan Petroleum Inst.), 6(8):620-626, 1963. 53 refs.

Harmful components of automobile exhaust gas are nitrogen oxides, olefins and carbon monoxide. The former two cause significant amounts of smog, including ozone and/or oxidants of hydrocarbons. The composition of automobile exhaust gas is significantly varied by differences in car, make, engine, age of the car, fuel, and driving conditions. Carbon monoxide, nitrogen oxides, and hydrocarbons increase during idling, acceleration of cruise, and deceleration, respectively. The amount of olefins in the exhaust gas increase with an increase in olefins in the fuel under average driving conditions; thus, the amount of olefins should be smaller. The use of liquid petroleum gas (propane or butane) can decrease smog production, though these liquid gases are expensive. An afterburner is an excellent device to remove harmful components of the exhaust gas by completing its combustion between the cylinder valve and tail-pipe into H2O and CO2. The direct flame afterburner uses high temperature, the catalytic afterburner uses low temperature by using catalysts (oxides of Co, Cu, Cr, Mo, W, V, Ni, Pt or mixtures of one or three of them). A chromite catalyst or activated carbon removes nitrogen oxides. The blowby gas emitted from the crankcase is supposed to have 25 to 35% of the total hydrocarbons in automobile exhaust gas.

7355 APTIC NUMBER 19444

Juentget, H. and K. H. Van Heek
PROGRESSES MADE IN THE RESEARCH OF PYROLYSIS OF BITUMINOUS COAL. (Fortschritte der Forschung auf dem Gebiet der Steinkohlenpyrolyse). Brennstoff-Chem. (Essen), 50(6):172-178, June 1969. 63 refs. Translated from German. Melov and Associates, Denver, Colo., 28p., May 12, 1970. (Presented at the DGMK Annual Meeting, Salzburg, Germany, Oct. 7-9, 1968.)

Research is reported which deals with new work in the field of coal decomposition at high temperatures (up to 10,000 K), the state of the knowledge pertaining to reaction kinetics of the gas formation during thermal decomposition of coal, and the correlation between bituminous coal analysis and combustion. Through the development of high-energy plasma burners and lasers, experimenters can now perform the thermal decomposition of coal using extremely high temperatures and correspondingly high heating rates. Additionally, differentiating physical instruments for the determination of the products of pyrolysis, new methods for the evaluation of measured data by the use of computers, and new techniques for the heating of coal samples facilitate exact studies of the reaction kinetics of the gas formation during pyrolysis. Discussion is presented pertaining to the thermodynamics of coal at high temperatures, the kinetics of coal pyrolysis, and the correlation of pyrolysis with other reactions occurring during the combustion of individual coal particles.

7356 APTIC NUMBER 21661

Kanno, Kyoichi
ON OZONE. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 2(1), 1964. 11 refs. Translated from Japanese. Melov and Associates, Denver, Colo., 15p., April 7, 1970.

Some general aspects of ozone science and technology are briefly reviewed. The odor of ozone was first recognized preceding thunderstorms or near electric generators, and is chiefly due to impurities in the gas. The theory, testing, and temperature and humidity effects of ozone production by silent dischargers are discussed. Conflicting opinions exist concerning the poisonous nature of the gas, although it seems clear that impurities, concentration, and length of time of exposure are important parameters. Because of its strong tendency toward acidification, ozone has important bactericidal, bleaching, and anti-odor applications. In recent indoor air purification technology, polluted air may be passed through an ozonizer to kill constituent microorganisms with a heavy dose of ozone; the polluted and purified air are then mixed to gradually purify the total ambient atmosphere. As a powerful oxidizing agent, ozone is effective in counteracting the odors of such substances as oxides, mercaptans, skatoles, and indols. A brief description of chemical and physical ozone detection methods is also given. The physical methods are preferred because they are faster, continuous, and more readily adjusted for precise measurements and sensitive changes.

7357 APTIC NUMBER 19217

Kawada, Nobu
THE SAFETY MEASURE OF BABCOCK RECOVERY BOILER. (Babukkoku kaishu boira no anzen taisaku). Text in Japanese. Kami-Pa Gikyoshi, (Journal of the Japanese Technical Association of the Pulp and Paper Industry), 24(7):361-366, July 1, 1970. 2 refs. Babcock Hitachi Co. (Japan).

The safety of recovery boilers is causing very grave concern due to explosions. In the United States, the Black Liquor Recovery Boiler Advisory Committee has been organized by users, insurance companies, and boiler makers. Babcock Hitachi, in cooperation with Babcock and Wilcox Company, is making a B and W Tomlinson Recovery Boiler. Based on the discussions of a conference held in London, the recovery boiler is considered to be safe. The Emergency Shutdown Methods of B and W Tomlinson Boiler vary according to the situation. When the furnace contains water the method is recommended as an Emergency Shutdown Procedure by the Committee. The fourth item of an Emergency Shutdown Procedure is adapted only to a B. W. Recovery Boiler. An explosion by the reaction of smelting and water is very dangerous. An explosion occurs when the tube of the furnace and the screen tube are broken and water touches the smelt in the bottom of the furnace. Therefore, corrosion of the tubes should be avoided. A jet stem atomizer for a heavy oil burner has been used. This is the most suitable supplementary burner for a recovery boiler.

7358 APTIC NUMBER 19907

Kerenyi, Dezso
AIROSOIL CAUSED BY VEHICLES. (A gepjarmuvek okozta levegoszennyezodes). Text in Hungarian. Energia Atomtech. (Budapest), 23(5):223-228, 1970.

The experiences of Budapest policemen regarding emissions from various types of automobiles at different locations of the city are related. Requirements necessary to prevent airosoil pollution in ambient air are pointed out and it is emphasized that desirable results can only be obtained through cooperation of the citizens. The power of the police should include the ability to impose immediate fines on polluting vehicles, as the driver should be aware of the regulations regarding his vehicle. (Author abstract modified)

7359 APTIC NUMBER 17633

Kikuchi, Itaru, Shinsaku Sato, Hiroshi Funaki, and Hikaru Sone
OFFENSIVE ODORS. 12. AIR POLLUTANTS GENERATED AT KP PLANTS. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 2p.

Measuring operations were conducted at several kraft pulping plants to determine the source of pollutants, especially the offensive odors. Measurements were made of the exhaust gases from the heavy oil boilers, the recovery boiler, and the turpentine condenser. The JIS method was used to measure sulfur oxides, and the MB method for hydrogen sulfide. With respect to offensive odors, efforts were concentrated on the measurement of volatile organic sulfur compounds, such as methylmercaptan and methylsulfide; for this purpose, gas chromatography was used. The results showed that the sulfur oxides were within the prefectural limit for public hazards. It was confirmed, however, that an excessive amount of fine dust is generated from the recovery boilers and bark boilers. Also, H2S amounting to 60 ppm was detected from the recovery boilers. Substantial amounts of methylmercaptan and methylsulfide were detected from the turpentine condensers and from the recovery boilers. These compounds were identified and quantitatively determined. Some peaks not yet identified were also obtained in the gas chromatograms.

7360 APTIC NUMBER 21874

Knop, W.
REDUCTION OF EMISSIONS IN VISCOSE PLANTS. (Emissionsverminderung in Viskosebetrieben). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:251-259, 1970. 19 refs.

The two most important pollutants produced by the viscose industry are carbon disulfide and hydrogen sulfide. In synthetic glass and synthetic wool plants, emission problems have been more or less solved by drawing off the pollutants at the point of origin, whereas in rayon plants, it is not yet feasible to completely encapsulate the spinning machines. Over the course of the years numerous H2S removal processes have been developed which were of little practical use; all these methods changed the air pollution problem into a water pollution problem. They were originally developed for desulfurization of the gases which developed from the coking process of hard coal. The Giammarco, Vetrocoke, Thylox, Stretford and Ferrisulf processes all involve oxidation. The first two use arsenic solution as scrubbing liquids, while the Stretford process binds H2S with vanadium compounds. The Ferrisulf process uses ion hydroxide for chemisorption of H2S, and it is closely related to the oldest dry desulfurization process which converts H2S with iron hydroxide, oxygen and water into elemental sulfur. While all H2S removal processes are uneconomical, it has become feasible for recover CS2 from the waste gases quite economically. Stationary or mobile activated coal layers are used for adsorption on CS2. In the sulfosorbon process the waste gas is blown through the activated coal adsorbers. Hydrogen sulfide is oxidized to sulfur, in the lower layer, while the upper layer carbon disulfide is adsorbed. The adsorber is regenerated. The sulfuric acid is washed out with water, the sulfur is extracted with CS2. The residual CS2 is driven off with water vapor at 110 to 130 C, and the waste gas is cleaned to a residual CS2 content of 50 to 10 mg/cu m, and to less than 1 ppm H2S.

7361 APTIC NUMBER 19325

Honda, Kiyoshi, Hisao Ito, and Atsuhiro Honda
FIELD EVALUATION OF EXHAUST GAS FROM REFUSE INCINERATOR RELATED TO

AIR POLLUTION AND METAL CORROSION. Trans. Soc. Heating, Air-Conditioning, and Sanitary Engrs. (Japan), vol. 7:95-104, 1969.

A study of municipal incinerator exhaust gas composition conducted at five sites in Japan is described. The study was undertaken to obtain information on odor and metal corrosion problems. The exhaust consisted of sulfur oxides, nitrogen oxides, ammonia, sulfuric acid, nitric acid, organic acids, and hydrochloric acid. Volatile organic acids and hydrochloric acid are mainly responsible for the corrosion, with sulfuric and nitric acids only partially concerned. Percentages of exhaust products as a function of raw refuse input are tabulated. Continuous firing rather than batch firing would limit noxious effluents. Temperature and excess air control would also help. After-burning chambers should be installed to further reduce contaminants.

7362 APTIC NUMBER 19719

Lamb, H. H.
VOLCANIC DUST IN THE ATMOSPHERE; WITH A CHRONOLOGY AND ASSESSMENT OF ITS METEOROLOGICAL SIGNIFICANCE. Phil. Trans. Roy. Soc. London, Ser. A., 226(1178):425-533, July 2, 1970. 181 refs.

The terms commonly used in reporting volcanic eruptions are defined, and previous approaches to the assessment of eruption magnitudes are reviewed. Eruption aspects of importance to meteorology - principally, the dust veils created in the atmosphere, particle sizes and distribution, heights, fall speeds, and atmospheric residence times - are examined. Spread of the dust by atmospheric circulation, and the direct effects apparent upon radiation, surface temperature, and extent of ice in the polar regions are considered. These effects, as well as various crude measures of the total quantity of solid matter thrown up, are used to arrive at numerical assessments of volcanic eruptions in terms of a dust veil index (dvi). The effect of latitude on atmospheric circulation is discussed. The time distribution of volcanic dust since the last Ice Age is indicated. The appendices give a chronology of eruptions, dvi values, and a series of graphs displaying circulation patterns. (Author abstract modified)

7363 APTIC NUMBER 19354

Ludwig, John H.
SEMINAR ON AIR POLLUTION BY MOTOR VEHICLES. 64p., 1970. 27 refs.

The contribution of motor vehicle emissions to air pollution levels is related to topographical and meteorological factors of the community, photochemical reactions in the atmosphere, and the nature of the vehicle. Motor vehicles in large metropolitan communities are estimated to be responsible for a large percentage of the critical precursors to photochemical smog: about 97% of the total olefins, 40-80% of the total hydrocarbons, and 14-67% of the oxides of nitrogen. The two-cycle diesel engine emits much higher hydrocarbons than the four-cycle diesel engine under all conditions cited, and more carbon monoxide and nitrogen oxides are emitted, except for the full load condition. Hydrocarbons and CO are highest under load conditions and lowest for idle, but nitrogen oxides increase with increased load as they do for gasoline powered vehicles. Carbon monoxide and hydrocarbon levels are comparatively low compared to spark-ignition engines, but diesels are probably more significant sources of nitrogen oxides. With gasoline engines, the nitrogen dioxide is less than about 10%, while 15-60% of the nitrogen oxides are present as NO2 in diesels. The California standards for exhaust emissions are provided for 1970, and reactions are given that can take place in the atmosphere, as well as source variations and weather factors.

7364 APTIC NUMBER 19565

Mader, Paul P., Merlyn W. Heddon, Marcel G. Pye, and Walter J. Hamming
EFFECTS OF PRESENT-DAY FUELS ON AIR POLLUTION. Ind. Eng. Chem., 48(9):1508-1511, Sept. 1956. 10 refs. (Presented at the American Chemical Society Meeting, 128th, Minneapolis, Minn., Sept. 1955.)

Individual olefins were tested for their oxidation capacity following the discovery that major differences existed in the oxidation capacity of isomeric olefins upon irradiation with sunlight in the presence of nitrogen oxides. When test data indicated that internal double bond olefins, as well as branched chain alpha-olefins are readily oxidized, an infrared spectroscopic study was undertaken to determine the quantities and kinds of olefins present in thermally cracked gasolines as compared with present-day gasolines. Catalytically cracked gasolines showed a 117.9% increase in olefins with internal double bonds and a 73.2% increase in branched chain alpha-olefins. Studies are underway to determine the effect on these increases on smog intensity.

7365 APTIC NUMBER 19346

Marquardt, W. and W. Schreiter
PROBLEMS AND PRECAUTIONS FOR MAINTAINING A CLEAN BIOSPHERE IN THE OPERATION OF MODERN POWER PLANTS. (Probleme und Massnahmen zur Reinhaltung der Biosphaere beim Betrieb moderner Kraftwerke). Text in German. Energietechnik, 19(2):53-56, Feb. 1969. 3 refs.

In the German Democratic Republic, the average power plant emits 5 to 25 g dust/cu m flue gas, while to reduce these emissions modern power plants are equipped with electrostatic precipitators with collection efficiencies of 98% or more. Thus, the problem of reducing dust emissions by these plants is considered to be solved, and of far greater importance are the sulfur dioxide emissions. Depending on the type of coal used for firing the boilers, between 10 and 40 tons/h of SO2 are thrown into the air by an average power plant. No economical flue gas desulfurization process has yet been developed. The only other way to avoid dangerous concentrations is to create favorable dispersion conditions. High stacks, high discharge speeds of the stack gas, and utilization of the thermal bucyancy are the measures presently employed to reduce SO2 concentrations in the biosphere. In addition, the site of future power plants must be selected with a

view to the most favorable meteorological conditions. Radioactive emissions by nuclear power plants are considered under control. Measurements in the vicinity of the nuclear power plant at Rheinsberg showed that over a period of 14 months only 5% of the maximum allowable values were emitted.

7366 APTIC NUMBER 21940

Marteney, Pierre J.
ANALYTICAL STUDY OF THE KINETICS OF FORMATION OF NITROGEN OXIDE IN HYDROCARBON-AIR COMBUSTION. Combust. Sci. Technol., Vol. 1:461-469, 1970. 18 refs.

The kinetics of formation of nitric oxide in hydrocarbon-air combustion were studied. Two UNIVAC 1108 computer programs were utilized to obtain time-dependent concentrations of chemical species in a subsonic stream. Inlet conditions specified were the temperature, pressure, and composition. Inlet temperatures were varied from 1000 K to 2000 K at pressures of 1 to 10 atm for equivalence ratios of 0.8 to 1.25. The inlet composition was taken to be a mixture of non-reacted gases. Equilibrium in the nitrogen oxides is very slowly attained with respect to the carbon and hydrogen oxides. The implication of this result is that observations of NO concentrations well below equilibrium values in certain types of engine exhausts may be correlated with the kinetics of formation, and that combustion temperatures and residence times, rather than exhaust temperatures, determine the level of NO in exhaust gases. (Author abstract)

7367 APTIC NUMBER 19209

Masek, Vaclav and Josef Sedlak
EXHALATIONS OF COKE OVEN PLANTS. (Exhalace z koksoven). Text in Czech. Hutnicke Listy (Prague), 25(1):149-153, 1970. 10 refs.

The total emissions escaping from all Czechoslovak coke oven plants in 1968 was 54 thousand tons; half of it was emitted through chimneys and half represented ground pollution. Thus, 5.5 kg kg of emissions was exhaled per 1 ton of coke produced. The dust content in the coke oven plants atmosphere is often higher than the allowed limit and contains carcinogenic aromatic compounds. The emissions by metallurgic coke oven plants (two fluids of all country coke oven plants) reached 36,500 tons in 1968. The major technological steps to solve this unsatisfactory situation are seen in improvement of design of the retorts (their charging, more effective thermal insulation of their top floor, gas desulphurization, etc.). By 1980 this would result in 80% decrease of total emissions. With the contribution of new production based on otherwise wasted emissions, the investment would return within 5 years.

7368 APTIC NUMBER 21953

Materials Advisory Board (NPC), Washington, D. C., Committee on Technical Aspects of Critical and Strategic Materials
TRENDS IN USAGE OF CADMIUM. Pub. NMAB 225, 15p., Nov. 1969. CFSTI, DDC: AD 700744

The consumption of cadmium in the United States by individual end users is analyzed. Electroplating accounts for about 50% of the total consumption. The use of cadmium as a constituent in stabilizers for polyvinyl chloride has become important, accounting for roughly 20% of consumption, and is increasing. Pigment consumption remains high and it also accounts for about 20% of consumption. Most of the remainder is used in batteries and various metallurgical applications. Cadmium is a product of zinc production, which is only slowly growing, and therefore the supply of cadmium is not very elastic. The uses of cadmium are varied, and except for electroplating, the cost is a small to modest fraction of the total cost of the end item; therefore, large areas of demand are not closely coupled to cost. As a consequence, modest changes in demand for even a single end use could have a profound effect on the cost of the metal. As a metal used in small amounts in numerous applications, its consumption pattern is subject to changing technology and, therefore, forecasting changes in the type of a consumption pattern for long periods of time is difficult. (Author abstract modified)

7369 APTIC NUMBER 19625

Middleton, John T.
THE PRESENCE, PERSISTENCE, AND REMOVAL OF PESTICIDES IN AIR. In: Research in Pesticides. C. O. Chichester (ed.), New York, Academic Press, 1965, p. 191-197. 20 refs.

Pesticides are an important class of toxicants capable of contaminating air, altering its quality, and producing adverse effects on man and his environment. They are used for controlling insects, nematides, rodents, plant diseases, and weeds. The presence and persistence of a pesticide and its effect on ambient air quality are functions of the chemical nature of the toxicant, its physical state, method of application, and atmospheric conditions. Indirect evidence of the persistence of insecticides in air is found in the contamination of feed and foodstuffs, and surface residues. Under windy, turbulent conditions as much as 8.0 ppm chlorinated hydrocarbon residue was shown to occur on alfalfa 100 feet downwind, whereas only 1.5 ppm occurred under good weather conditions. The amount of drift residue is directly proportional to the rate of active chemical applied, while sedimentation and impaction of liquid insecticide particles are the most important factors in drift hazards. Spray droplets 10-15 microns in diameter usually produce the greatest ground contamination. The presence and persistence of fungicides and herbicides cannot be directly assessed because published information is lacking on air concentrations. Pesticide drift can be markedly reduced by using proper equipment that gives desirable distribution patterns, sprays of suitable particle size, avoidance of dust, and restricting applications to periods of good weather conditions which confine the material to the application site.

7370 APTIC NUMBER 21722

Murozumi, M., Tsaihwa J. Chow, and C. Patterson
CHEMICAL CONCENTRATIONS OF POLLUTANT LEAD AEROSOLS, TERRESTRIAL DUSTS AND SEA SALTS IN GREENLAND AND ANTARCTIC SNOW STRATA.
Geochim. Cosmochim. Acta, vol. 33:1247-1298, 1969. 71 refs.
CFSTI, DDC: AD 697871

Lead analyses in annual ice layers from the interior of northern Greenland and from the interior of Antarctica are reported. Lead concentrations increase from less than 0.001 gamma Pb/kg ice at 800 BC to more than 0.200 gamma Pb/kg ice today in North Pole ice sheets, the sharpest rise occurring after 1940. The lead levels in South Pole ice sheets are generally below detection limits before 1940 and rise to only about 0.020 gamma Pb/kg ice after 1940. The increased lead levels at the North Pole are ascribed mainly to lead smelters before 1940 and to burned lead alkyls after 1940. The difference between the lead concentrations in the northern and southern polar snows is ascribed to barriers to north-south tropospheric mixing; these originate from meridional circulating cells which hinder the migration of aerosol pollutants from the northern hemisphere to the Antarctic. The Greenland interior ice contains about ten times more dust than Antarctic interior ice, but the latter contains twice as much sea salt as the former. The proportions of sodium, chlorine, magnesium, calcium, and potassium adhere closely to sea salt ratios in ices relatively free of silica dusts. In Greenland, the amounts and chemical composition of silica dusts are similar in both coastal and interior ices. Concentrations of lead and sea salts increase in the winter, while concentrations of silica dust increase in the spring. (Author abstract modified)

7371 APTIC NUMBER 19809

Oka, M.
EXHAUST GAS OF THE AUTOMOTIVE DIESEL ENGINE. (Diizeru haikigasu ni tsuite). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8(2):27-33, June 1970. 13 refs.

Air pollutants from diesel exhaust include smoke, soot, carbon monoxide, nitrogen oxides, hydrocarbons, sulfurous gas, and odor. From the public nuisance point of view, black smoke and nitrogen oxides are the relatively more important items. Black smoke generation is mainly due to the fuel-air ratio, rapidly increasing when the load increases and not enough air is supplied. In addition, fuels with a higher C/H ratio produce more smoke. An explanation of the production process for nitrogen oxides is given whereby the existence of an oxygen pool in the combustion chamber of the diesel engine during the early stage of combustion leads to the creation of the oxides of nitrogen. Various methods and devices for measuring the smoke, nitrogen oxides, and hydrocarbon components of diesel exhausts are presented tabularly. Basic principles behind each method are listed. The methods for abating smoke from diesel exhaust are: improvement of the combustion process as well as fuels, maintenance of engines, additives, fumigation, dilution, engine derating, and filtration mufflers. Furthermore, various processes and peripheral data pertaining to the generation of nitrogen oxides are given and plotted accordingly. They include the effects of the fuel-air ratio, the fuel injection period, timing of fuel injection, air intake temperature, and air intake pressure. As various methods of reducing the oxides of nitrogen by way of engine modification, water injection and exhaust gas recycling methods are presently under research. Also, abatement by reduction by means of catalysts is under consideration, but due to the problems of effective temperature and engine endurance, the method is not yet applicable to automobiles.

7372 APTIC NUMBER 19536

Ozimek, Richard T.
SULFUR. Chem. Week, 95(11):71-82, 84, 86, 88, 90, 94, Sept. 12, 1964.

The supply and demand requirements of the world sulfur market are discussed. Recovery of elemental sulfur from sour gas has been instrumental in changing the market, and the Canadian and French influence on the market is discussed. The United States is the largest sulfur-producing nation in the world, and most U. S.-produced elemental sulfur is mined by the Frasch process in the southeastern part of the country. Differences between elemental sulfur and nonelemental sulfur are described. Sulfur is the chemical industry's most widely used raw material with most of it used in making sulfuric acid for which the fertilizer industry is the chief customer. Other uses include paper making, steel manufacturing, petroleum refining, and miscellaneous chemical manufacturing. Principal overseas markets are discussed. Besides India, the governments of Formosa, South Korea, Malaysia, Pakistan, the Philippines, South Vietnam, Thailand and Japan are all rapidly building up fertilizer industries to achieve more efficient crop production. Italy is trying to modernize its sulfur industry, and reorganization involves: closing of uneconomical mines; establishment of new sulfur, and potash processing mines near Gela; transfer of workers from the closed sulfur mines to potash mines; retraining of miners to work in other industries. Because of a wide increase in demand, coupled with a drop in nonelemental sulfur production, Frasch sulfur producers are anticipating greatly increased sales.

7373 APTIC NUMBER 19091

Perdon, H.
PREVENTION OF AIR POLLUTION CAUSED BY FURNACES. (La prevention de la pollution atmospherique due aux foyers). Text in French. Le Monde Industriel, 94(665):1-32, Sept. 1968.

The subject of furnaces as a pollution source is reviewed in terms of the following: relationship of power consumption to air pollution; nature of pollutants; gaseous, solid, and liquid fuels; quality of combustion in heating plants; treatment and dispersal of combustion products; means of measurement and control; means of informing and improving the competence of the consumer; legal provisions for the regulation of such plants. Public utilities have recently become aware of the need for research and for concerted action against pollution.

7374 APTIC NUMBER 19471

Perry H. and J. H. Field
AIR POLLUTION AND THE COAL INDUSTRY. Trans. AIME (Am. Inst. Mining, Metallurgical, and Petroleum Engr.), vol. 238:337-345, Dec. 1967. 14 refs.

Legislation intended to limit emissions of pollutants or the type of fuel that can be utilized, particularly as it applies to the coal industry, is reviewed. Emission limits of various codes and regulations are tabulated. Effluents from coal operations include sulfur oxides, nitrogen oxides, hydrocarbons, carbon dioxide, smoke, and flyash. The nature and magnitude of air pollution problems affecting the mining, preparation, coking, and combustion of coal are described. Application of various particulate control devices, including electrostatic precipitators, and cyclones, is discussed. Nitrogen oxides can be controlled by excess or secondary air and by catalytic decomposition. Sulfur oxide emissions can be controlled by using low-sulfur fuel, improved combustion efficiency, alkaline additives, scrubbers, and desulfurized fuel. Methods of partial and complete desulfurization of fuels are reviewed. Processes for the specific removal of sulfur dioxide include absorption, alkaline additives, Reinluft process, catalytic oxidation, and alkalized alumina.

7375 APTIC NUMBER 21978

Pustinger, J. V. Jr., F. W. Hodgson, J. E. Strobel, and R. L. Evers
IDENTIFICATION OF VOLATILE CONTAMINANTS OF SPACE CABIN MATERIALS. Monsanto Research Corp., Dayton, Ohio, AF Contract F33615-67-C-1357, Proj. 6302, Task 630204, Work Unit 008, AMRL-TR-69-71, 68p., Oct. 1969. 4 refs.
CFSTI: N70-19600

Nineteen candidate space-cabin materials were tested to determine weight loss characteristics and to identify their gas-off products. The materials were screened initially, using thermogravimetric techniques for measuring weight loss at moderate temperatures (ambient to 68 plus or minus 2 C) for 22.5 hours in 5 psia nitrogen, to select those candidate materials that lose from 0.001 to 1.0 of their weight, excluding water. The selected materials were then stored in 9-liter chambers at 68 plus or minus 2 C for 72 hours and at 25 plus or minus 2 C for 30 days. Atmosphere in the chambers was oxygen at 5 psia. The gaseous contaminants evolved from the test materials were identified by combinations of gas chromatography and mass spectrometry. Gas-off products observed were mostly entrapped solvents. Only two materials exhibited excessively high (greater than 1.0) emission values. The thermogravimetric procedures for screening candidate materials provided a good measure of the rate of volatile emission. However, the use of this approach as a rapid screening technique requires excessive time.

7376 APTIC NUMBER 19814

Rasmussen, Reinhold A.
ISOPRENE: IDENTIFIED AS A FOREST-TYPE EMISSION TO THE ATMOSPHERE. Environ. Sci. Technol., 4(8):667-671, Aug. 1970. 26 refs. (Presented at the American Chemical Society 157th National Meeting, Division of Water, Air, and Waste Chemistry, Minneapolis, Minn., 1969.)

Direct gas chromatographic, infrared, and mass spectrometric analyses of the air in contact with the plant foliage for five common tree species confirm previous observations of the existence of isoprene as a plant product. The foliages studies were on intact plants in leaf assimilation chambers under static conditions. Light quality was a mixture of Gro-Lux, cool white fluorescent tubes, and incandescent bulbs. The light intensity was 1100 ft candella and the temperature was 28 C; relative humidity reached 92% in the closed chamber within 10 min. Increasing concentration of the foliage-released volatile organic (isoprene) was monitored using 1-ml gas samples injected into the gas chromatograph. When the concentration of isoprene in the chamber reached 15-20 ppm, 1 liter of air in the chamber was transferred by a syringe pump to a saran plastic gas sampling bag which was usually analyzed by infrared and mass spectroscopy within four hours after collection. The presence of isoprene as indicated by gas chromatographic retention time data was observed in more than 30% of the 230 plant species surveyed. Nonaromatic foliages of oaks, willows, aspens, cottonwoods, and plane-trees released only isoprene in any appreciable quantity. When a group of 16 people in the laboratory was asked to smell these accumulated foliage isoprene volatiles from the nonaromatic leaves, the description given most often was 'smells like an oak forest,' whereas the response for smelling nonisoprene releasing foliages like maples, ash, birches, and alders was 'smells like fresh leaves.' Analysis of the air in contact with conifer foliages showed that only the genus Picea (spruce) released isoprene as a foliage volatile. Emanations of isoprene from the spruce needles did not respond to short-term fluctuations in transpiration. Mass spectra of isoprene and the foliage volatile were identical with a parent ion having a mass to charge ratio (m/e) of 68, representing the molecular weight of isoprene and a base peak of m/e 67 formed by the loss of a single H atom. Other prominent peaks were m/e of 53 from the loss of a methyl group and m/e of 39 which is the possible cyclopropene ring from skeletal rearrangement. Isoprene was also resolved directly from the out-of-doors air over mango foliages in Panama at concentrations of 0.5 to 24 ppb in 5 ml of air. The biological and air chemistry fates of isoprene are discussed. The fate of alpha-pinene and isoprene in the atmosphere may be similar to that of olefins from automobile exhaust; these studies suggest that naturally occurring organic volatiles are disposed of in a biological sink. (Author abstract modified)

7377 APTIC NUMBER 21854

Rokushika, T. and M. Aoyama
CO CONCENTRATION IN VARIOUS AUTOMOTIVE EXHAUSTS. (Shashubetsoo ni mita jidohsha haishutsoo gas CO nohdo ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):92, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The concentrations of carbon monoxide in exhaust gases from

automobiles in present use are measured in their exhaust pipes by means of a non-dispersion type infrared spectrometer. Taxi cars (66 cars measured) using propane as fuel, when idling, emit 5.3% CO for 1500cc cars and 6.1% for 2000 cc cars, but 2.5% and 0.8%, respectively, when running at 50 km/hr. Private gasoline engine cars (63 cars) also emit 5.1% when idling. Diesel engine cars (10 cars) give almost no carbon monoxide. Since these carbon monoxide concentrations vary car by car, regardless of the year it was manufactured, they may depend on how engines are tuned up.

7378 APTIC NUMBER 17291

Saruta, Nanio, Noburu Ishinishi, Yasushi Kodama, Eizaburo Kunitake, Toshio Baba, and Yoko Katori
AIR POLLUTION CAUSED BY EXHAUST GASES FROM MOTOR VEHICLES IN BOTH KITAKYUSHU CITY AND JUKUOKA CITY (II). (Kogyotoshi to shogyotoshi ni okeru jidosha haikigasu ni yoru taiki osen no hikaku --- kitakyushushi oyobi fukuokashi ni okeru jittaichosa kara (II)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(12):779-787, Dec. 15, 1968. 11 refs.

Two principal types of urban air pollution were recognized by a survey conducted in both industrial and business areas which contrasted each other with respect to social and economic structural differences. Stack smoke from industrial plants is an important constituent of urban air pollution. Concentrations of dust and sulfur dioxide are higher in industrial areas than carbon monoxide. Dust and SO2 concentrations in the proximity of the source decline in proportion to an increase of CO. This result is evidently identified with the transition of types from one to the other. Even lower concentrations of SO2 in industrial air pollution are dangerous when followed with dust. Separately their effects on human health are of less significance. Air pollution in the business area originates in automotive exhaust emissions which have a stimulating affect on the generation of lung cancer because of the lead compound contained in the gasoline. Dust from boiler heating forms an additional part of the urban industrial pollution. These major sources are regarded as factors in the occurrence of photochemical smog. Although two principle types of industrial and business air pollution varies in its source, both its effects on public health can not be graded but are similar in view of enviornmental hygienics.

7379 APTIC NUMBER 19899

Sawaya, Tsuqio
SURVEY ON THE PUBLIC NUISANCE BY OFFENSIVE ODOR. (Akushu kogai gairon). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8(2):34-46, June 1970. 12 refs.

Offensive odor as a public nuisance can be classified according to its composition in the following industrial sources: hydrocarbons and mercaptan from petroleum refining; organic sulfur compounds such as mercaptan from paper and pulp factories; and amine and fatty acids from fish meal and rendering factories and stockyards. Odors of each category are explained. While it is well established that olfactory reception is caused by a stimulus given to nerves by gaseous substances or air-borne particulates, the mechanism of the stimulus is not yet known. Odors of industrial waste water are classified into the following, that is, aromatic, free chlorine, disagreeable, earthy, fishy, grassy, moldy, musty, peaty, sweet, free hydrogen sulfide, and vegetable. Weber-Fechner's law, fatique, personal differences, and interference of odors are described. Definitions of threshold and odor concentration are provided. Measuring methods of odor include dilution by air, equilibrium with salt water, and a method used by processing factories to monitor the total amount of odor substances. Physical or chemical methods are available for odor abatement. Scrubbers, condensation by cooling, adsorption by active carbon, and dilution by air are in the physical category, while chemical methods include processing by acid, alkali, chlorine, or ozone, ion exchange, masking, recombustion, and catalytic combustion.

7380 APTIC NUMBER 19040

Sawhill, Roy B., James H. Matteson, and Jerome W. Hall
VEHICLE CHARACTERISTICS OF FUEL AND TRAVEL TIME ON URBAN ARTERIALS AND FREEWAYS. Washington Univ., Seattle, Contract Y-1142, RR-14A, 44p., Jan. 1970. 8 refs.
CFSTI: PB 190538

The impact of urban freeways on vehicle operating characteristics of travel time and fuel consumption is evaluated. A comprehensive, long-term 'before and after' study is discussed. Travel time and fuel consumption data were collected for five classifications of vehicles operating over four parallel arterial routes as well as on the freeway. On only two of the parallel routes was there a statistically significant reduction in traffic volume with a corresponding saving in travel time. The total time savings benefit for 1968 as a result of the freeway was $30,737,000 or about 12% of the construction costs. Statistically significant fuel savings were observed for the passenger car on two of the secondary routes but not on the major parallel route, even though a time savings was experienced. The total system fuel savings is $366,000 for 1968. Approximately 2% of this benefit is attributable to diesel-powered vehicles. (Author abstract modified)

7381 APTIC NUMBER 21867

Shoji, Hikaru, Kondsuke Nishida, and Yoshinori Ishikawa
THE DRIVING CYCLE IN THE METROPOLITAN AREA OF KYOTO CITY. STUDY ON THE AIR POLLUTION DUE TO AUTOMOBILE EXHAUST. (Kyyto-shi ni okeru jidosha no soko saikuru nitsuite: Jidosha haiki ni yoru taiki osen). Text in Japanese. Tohoku Gakukai Ronbun-shu (Trans. Japan Soc. Civil Eng.), 43(8):37-50, Aug. 1968. 24 refs.

The driving patterns in the Kyoto metropolitan area were analyzed into four modes of driving (idling, acceleration, cruise, and deceleration). The car used in this experiment was the Prince Skyline (1500 ml, model of 1961) sedan with a shift-gear transmission (four forward changes and one backward change). The fuel used was ESSO gasoline with 75 to 85 octane. A tacograph (TCO-11) and 24 minute watc were used for recording the driving

pattern, and a tune-up tester V-12 was used for recording the changes of engine rotation during the driving. The driving was performed in 30 ways in a rather crowded area with other cars on the street between noon and 7:00 pm, from October 1 to December 20, 1966. The speed on these streets ranged from 11.9 to 44.1 km/hr with an average of 20.8 km/hr. The time spent for idling, acceleration, cruise, and deceleration were 8.0 to 48.0%(30.3%), 15.0 to 40.6%(25.8%), 0 to 63.3%(26.9%), and 11.0 to 46.3%(17.0%), respectively for 4 hours 4 minutes 2 seconds. The frequency of idling, acceleration, cruise, and deceleration were 248, 381, 308, and 359 times, respectively. Composed 4, 5, and 6 mode cycles were used to analyze the driving patterns of the car and to obtain the frequency of these patterns. It is important to obtain correct information of the driving patterns and their frequencies for the evaluation of automobile exhaust gas in a city.

7382 APTIC NUMBER 21759

Smith, Donald Stanley
SPECTROSCOPIC INVESTIGATION OF HYDROXYL RADICAL CONCENTRATION AND OF END GAS TEMPERATURE IN A CYCLIC COMBUSTION PROCESS. California Univ., Berkeley, Coll. of Engineering, Thesis (Ph.D.), 95p., 1968 (?). 72 refs.

A high resolution monochromator and a CFR engine were used to determine the concentration history of an unstable species, the hydroxyl radical, and the optical temperature during the post combustion transient process. The average bulk temperature was determined. The effect of fuel-air ratio, engine speed, knock condition, and an antiknock additive on concentration histories was observed. Significant cycle-to-cycle variations in concentrations were measured. The experimental results obtained for the high pressure post combustion history of the hydroxyl radical agree qualitatively with the trends obtained from low pressure flame studies. The degree of hyperequilibrium in the post combustion process in the engine cylinder varies from approximately three times for the leanest mixture to seven times for the richest mixture. At the conclusion of combustion, the OH concentrations approach in absolute magnitude the chemical equilibrium values as the reaction proceeds. Quantitatively, however, hyperequilibrium is considerably less in the engine process than in the flames. Tetraethyl lead additives, engine speed, and engine knocking produced small or statistically insignificant effects on the hydroxyl radical concentration.

7383 APTIC NUMBER 17632

Some, Hikaru, Tetsuo Takijima, Shinsaku Sato, and Itaru Kikuchi
OFFENSIVE ODORS. 11. OFFENSIVE ODORS FROM MARINE PRODUCTS PROCESSING PLANTS. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 3p.

The offensive odors from 28 marine products processing plants were measured, using the saline solution equilibration method. Odor specimens were drawn off from the chimney flue with a vacuum pump into a 1% saline solution until saturated. The solution was then diluted to determine the odor concentration by the dilution multiple. It was found that 60% of the plants exceeded the standard limit set for public hazards. The maximum value was 2500. The odor concentration was high for sharks and for fish entrails which had lain for several days. Six different types of plants were selected as test plants in Ishinomaki City to determine the efficiency of deordorizing equipment. The rate of elimination of offensive odor was 80-90%, and the odor concentrations were reduced to below 300. The efficiency was even greater when a large amount of water was used.

7384 APTIC NUMBER 19039

Stahl, Quade R.
PRELIMINARY AIR POLLUTION SURVEY OF CHLORINE GAS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-33, 79p., Oct. 1969. 187 refs.
CFSTI: PB 188087

The effects, sources, abatement, and methods of analysis for pollution due to chlorine gas are reviewed, as its production has doubled in the past 10 years. Methods of analysis are available, but they are not sufficiently sensitive or selective for determining atmospheric concentrations of chlorine. Possible sources are industrial liquefication processing, other industrial uses of chlorine, and accidental leakage during storage or transportation. To prevent pollution from these sources, the emissions from these systems can often be piped to the sniff gas system or tied in directly either to a scrubber system or a high stack for dispersion. Low concentrations (3000 micrograms/cu m) can cause irritation of the eyes, nose, and throat; larger doses can cause damage to the lungs and produce pulmonary edema, pneumonitis, emphysema, or bronchitis. Chlorine gas is known to have caused injury and death to humans and animals as well as to have damaged plant life. (Author abstract modified)

7385 APTIC NUMBER 21751

Stahl, Quade R.
PRELIMINARY AIR POLLUTION SURVEY OF MERCURY AND ITS COMPOUNDS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div. Contract PH 22-68-25, NAPCA Pub. APTD 69-40, 96p., Oct. 1969. 243 refs.
CFSTI: PB 188074

The effects, sources, abatement, and methods of analysis are reviewed for pollution due to mercury and its compounds. Significant sources appear to be the mining and refining of mercury and the use of mercury in industrial and scientific laboratory applications. Russian experiments with animals indicate that continuous exposure to mercury vapor above 0.3 micrograms/cu m of air may present a health hazard. Mild symptoms of mercury intoxication are psychopathological in nature and thus can present serious problems in diagnosing the cause. Recent air measurements of particulates in New York indicate that the mercury concentration of indoor samples is as high as 40 micrograms/cu m, or several times higher than that found safe in

animal experiments using mercury vapor. Some organic mercury compounds, particularly the alkyl derivatives, are much more toxic than elemental mercury or the inorganic compounds. Portable continuous monitoring detectors, battery-operated vapor detectors, absorption techniques, radiochemical methods, and colorimetry are some of the approaches available to detect mercury vapor. Mercury can be removed by use of water scrubbers, a pyrolusite absorber, sweeping with special vacuum cleaners, and chemical treatment. (Author abstract modified)

7386 APTIC NUMBER 21991

Stahl, Quade R.
PRELIMINARY AIR POLLUTION SURVEY OF ALDEHYDES. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-24, 134p., Oct. 1969. 221 refs.
CFSTI: PB 188081

The effects, sources, abatement, and methods of analysis of aldehydes are reviewed, as ambient air measurements indicate that in 1967 the average concentrations for several cities ranged from 3 to 79 micrograms/cu m. Vehicle exhaust appears to be the major emission source, but significant amounts may be produced from incineration of wastes and burning of fuels. Local sources of aldehydes may include manufacturing of chemicals and other industrial processes that result in the pyrolysis of organic compounds in air or oxygen. Atmospheric aldehydes can also result from photochemical reactions between reactive hydrocarbons and nitrogen oxides, and moreover, they can react to produce other products, including ozone, peroxides, and peroxyacetyl nitrate compounds. Low concentrations principally affect humans and animals by irritation of the mucous membranes of the eyes, upper respiratory tract, and skin; animal studies indicate that high concentrations can injure the lungs and other organs of the body. Although combustion control methods, such as catalytic afterburners, generally decrease the amount of hydrocarbon emissions, they may actually produce greater amounts of aldehydes. Common sampling methods employ bubblers or impingers containing a reactive reagent, while infrared spectroscopy, and many colorimetric methods are applicable to formaldehyde, acrolein, and aldehydes. (Author abstract modified)

7387 APTIC NUMBER 19597

Stephenson, Junius W.
INCINERATION - PAST, PRESENT, AND FUTURE. Preprint, American Society of Mechanical Engineers, New York, 20p., 1969. 49 refs. (Presented at the American Society of Mechanical Engineers Winter Annual Meeting, Los Angeles, Calif., 1969, Paper 69-WA/Inc-1.)

The history of municipal incineration, its present status, and possible future developments are reviewed. The first such incinerator was built in Nottingham, England in 1874, but incinerator technology advanced most rapidly after World War II. Major breakthroughs in the early part of this period were the application of mechanical stokers to incineration and development of the continuous feed furnace. Plants which reclaim waste heat from incineration processes for production of steam power are currently receiving attention, but will probably be economically justifiable only in a relatively small number of large-scale centrally located installations. Air pollution control requirements are becoming increasingly stringent. Gaseous pollutants in incinerator stack effluents are generally so small in quantity that at present there are no control regulations; however, cleaning efficiences as high as 95-98% on particulate emissions are either in effect or anticipated, especially for larger plants. At present, the only apparent means of approaching such efficiency is through the use of medium or high energy scrubbers, bag filters, or electrostatic precipitators. A first-hand comparison of the operating characteristics of various cleaning systems will be available when several new plants in U. S. and Canadian communities have been in operation a sufficient length of time. Specially designed incinerations are being considered for incineration of bulky refuse. For the future, various slagging and pyrolitic processes present interesting possibilities for application to large scale municipal refuse disposal.

7388 APTIC NUMBER 19705

Stone, Ralph
SEWAGE TREATMENT SYSTEM ODORS AND AIR POLLUTION. J. Sanit. Eng., Div. Am. Soc. Civil Engrs., 96(SA 4):905-909, Aug. 1970. (Presented at the American Society of Civil Engineers, Water Resources Engineering Conference, Memphis, Tenn., Jan. 26-29, 1970.)

The major air pollution problem associated with sewerage systems is odor. Sludge or screening incinerators may discharge particulate matter, incompletely combusted organic compounds, nitrogen oxides, and sulfur dioxides, all of which are air pollutants. The intensity of sewage odor production is dependent upon the following factors: organic concentration, temperature, sulfate content, detention time, agitation, microbes, pH, and flow depth. Methods of odor control are: preventing the odors from forming; preventing the odors from reaching the atmosphere; and removing or renovating the odors which have been formed. Odors may be suppressed by the following methods: sewer maintenance to remove biological slimes, grease, and silt; addition of oxidation or reduction compounds; precipitation of sulfides; waste pre-treatment to reduce waste strength; and the use of perfumed masking agents. Odors can be prevented from reaching the atmosphere by sealed enclosures, and collected by a partial vacuum within the disposal facility. The odors and air pollutants such as particulate matter or nitrogen oxides can be reduced by appropriate afterburners, scrubbers, activated carbon or other specialized equipment. (Author abstract)

7389 APTIC NUMBER 21772

Sullivan, J. L. and G. J. Cleary
A COMPARISON OF POLYCYCLIC AROMATIC HYDROCARBON EMISSIONS FROM

DIESEL- AND PETROL-POWERED VEHICLES IN PARTIALLY SEGREGATED TRAFFIC LANES. Brit. J. Ind. Med., 21(2):117-123, April 1964. 7 refs.

As the result of special traffic conditions at a point in Sydney, diesel-powered vehicles are partially segregated in one of 10 road lanes during the peak evening period. Because of this, it was possible to sample simultaneously in two of the road lanes, about 40 ft apart, only one of which was carrying diesel vehicles. Samples were collected for part of the evening traffic peak period for approximately one month, then pooled and analyzed for polycyclic aromatic hydrocarbons. Because it was also necessary for vehicles to stop briefly, all were accelerating past the sampling point. An association was established between traffic containing diesel vehicles and the concentrations of smoke, 1,2-benzpyrene, 3,4-benzpyrene, 1,12-benzperylene, and coronene. (Author abstract)

7390 APTIC NUMBER 21982

Sullivan, Ralph J.
PRELIMINARY AIR POLLUTION SURVEY OF CHROMIUM AND ITS COMPOUNDS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-34, 75p., Oct. 1969. 111 refs.
CFSTI: PB 188075

The effects, sources, abatement, and methods of analysis of chromium are reviewed, as urban air concentrations average 0.015 microgram/cu m in 1964 and ranged as high as 0.350 microgram/cu m. Workers in the chromate-producing industry have experienced deaths caused by cancer of the respiratory tract at a rate 28 times greater than the normal expected death rate, while exposure may also produce dermatitis and skin ulcers. Hexavalent chromium compounds are more toxic than trivalent compounds, and hypersensitive people react to hexavalent compounds in very low concentrations (0.0001% potassium dichromate solution). Chromic acid mists discolor automobile and building paints. The uses of chromium in the metallurgical and chemical industries and in products employing chromate compounds, as well as its presence in cement and asbestos, are believed to be the most likely sources of atmospheric pollution. Procedures for analysis include sampling methods, spectroscopy, atomic absorption, ring oven technique, flame spectrometry, and coulometry. (Author abstract modified)

7391 APTIC NUMBER 22000

Sullivan, Ralph J.
PRELIMINARY AIR POLLUTION SURVEY OF IRON AND ITS COMPOUNDS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-38, 94p., Oct. 1969. 225 refs.
CFSTI: PB 188088

The effects, sources, abatement, and methods of analysis for pollution due to iron and its compounds are reviewed, as urban air samples show that the iron content averages 1.6 microgram/cu m, with the iron and steel industry probably the most likely source of emission. Pollution by iron emission can be reduced by use of particulate control equipment, but costs of abatement for basic oxygen furnaces run between 14 to 19% of total industrial plant costs. The impinger, electrostatic precipitator, and filter are commonly used to collect dusts and fumes of iron compounds, while quantitative determinations employ spectroscopy, spectrophotometry, and two spot-test methods. Iron and iron oxide are known to produce a benign siderosis, and iron oxides have been implicated as a vehicle for transporting high concentrations of both carcinogens and sulfur dioxide deep into the lungs, thereby enhancing the activity of these pollutants. Iron oxide also causes damage by staining materials. (Author abstract modified)

7392 APTIC NUMBER 19598

Tada, Osamu
AUTOMOTIVE EMISSIONS AND AIR POLLUTION. (Jidosha haiki to taiki osen). Text in Japanese. Rodo Kagaku. J. Sci. Labour, Tokyo), 41(10):481-492, 1965.

An extensive review of the literature on chemical composition, photochemical production, environmental level, and biological effects of automobile exhaust gas is presented. Chemical composition of the automobile exhaust gas differs according to the action of the engine (idling, acceleration, cruise, and deceleration) and the air to fuel ratio. Exhaust gas of a diesel engine characteristically has low concentrations of carbon monoxide, hydrocarbons (olefins, paraffins, and aldehydes), nitric oxide, nitrogen dioxide, sulfur dioxide, and 3,4-benzpyrene. In a gasoline or propane gas engine, CO and aldehyde are increased during idling and deceleration of the engine, respectively. The 3,4-benzpyrene which is potentially carcinogenic is included more in the exhaust gas of a gasoline engine than that of a diesel engine. Lead is included in the anti-knock agent, and is changed to haloid lead or its ammoniac salt causing small particles of less than 5 microns in diameter (4 to 12% of the particles have diameters of 1 to 0.1 micron). The main components of the Los Angeles type smog are the secondary products (nitro-olefin, aldehyde, ozone, or other oxidants) of automobile exhaust gas emitted into the ambient air which have harmful effects on plants and human bodies. A systematic study of the automobile exhaust gas harmful to human bodies showed that the main pollutants from the ambient air are CO and Pb compounds, and neither benzpyrene nor anthracene is greatly related to air pollution. In Tokyo in 1962, CO, NO2, SO2, and HCHO showed high concentration in the center of Tokyo, while O3 had higher concentration in the suburban area. Principles of air pollution due to automobile exhaust gas should be established more precisely in Japan.

7393 APTIC NUMBER 19409

Tomaides, M. and K. T. Whitby
AN IMPROVED EXPLODING WIRE AEROSOL GENERATOR. Preprint, Minnesota Univ., Minneapolis, 6p., 1969 (?). 9 refs.

An exploding wire-type aerosol generator, improved to provide safe and automated operation, is described. Design characteristics of the unit are included. The aerosol generated by the unit was evaluated by the use of electron microscopy. Studies were made to estimate the influence of discharge voltage, amount of stored energy, fixed electrode polarity, wire material, and method of sampling on the quantity of aerosol and shape of the aerosol particles. Size distribution can be expressed, on the average, by number median diameter of 0.03 micron and geometric standard deviation of 2.0. Schematic diagrams of the aerosol source and electric circuit are included.

7394 APTIC NUMBER 19318

Walterscheid, Edward C.
NUCLEAR POWER. Analog Sci. Fiction/Sci. Fact, 86(1):32-69, Sept. 1970.

Similarities and differences between nuclear and fossil-fueled electric power plants are discussed. The chief similarity is their inefficiency. Fossil-fueled plants can achieve net efficiencies of 38-40%; light-water-reactor nuclear power plants now in use in this country achieve a net 32%. Power plants, fossil- or nuclear-fueled must dissipate a tremendous amount of heat to their surrounding environment. In a fossil-fueled plant, about 15% of the heat input is lost through the stacks, boilers, turbines, and for station use. There is no stack loss in a nuclear plant and other inplant losses amount to 5%. The remainder of the heat is dissipated to the atmosphere through condensers which can require large amounts of cooling water. In passing through the condensers, the cooling water is heated 10 to 20 degrees or more depending on plant design. Almost 1/3 of all the water used in the United States is used as cooling water for these plants. Both nuclear and fossil fueled plants produce certain waste products which must be dealt with. The wastes from fossil fueled plants are considered air pollutants and consist primarily of fly-ash and gaseous oxides of sulfur, nitrogen, and carbon. Carbon dioxide is being added to the atmosphere at a rate of 6 billion tons a year by the burning of fossil fuels. The problem associated with wastes from nuclear power plants is radioactivity. However, from a biological point of view, more radioactivity is released to the environment by operation of a large fossil fueled power plant than by the equivalent sized nuclear power plant. This release is in the form of several isotopes of radium present in coal and oil which are emitted to the atmosphere in fly ash. While this does not constitute the formation of new radioactivity such as occurs in a nuclear power plant, it does have a similar effect on the environment. It is, however, in the formation of new radioactivity that the future promise of the nuclear power plant lies. Reactors have been designed that create more nuclear fuel than they use. When the dwindling reserves of fossil fuels are considered, these nuclear 'breeder' reactors look like the best available means of meeting the projected requirement to quadruple or quintuple our generating capability by the year 2000.

7395 APTIC NUMBER 21933

Wasserberger, Jonathan, Jack L. Radomski, and Wm. R. Deichmann
NITRO-OLEFINS, COMBUSTION PRODUCTS OF HYDROCARBONS. III. 3-NITRO-2-METHYL-2-BUTENE, A COMBUSTION PRODUCT OF 2-METHYL-2-BUTENE. Ind. Med., 39(5):49-52, May 1970. 18 refs.

Gas chromatographic analysis of the exhaust obtained from the combustion of pure 2-methyl-2-butene (the principle olefin in a premium grade gasoline) revealed the presence of the corresponding nitro-olefin, 3-nitro-2-methyl-2-butene. An indication of the possible presence of this nitro-olefin in the combustion products of gasoline was obtained. However, attempts at isolating and positively identifying the peak corresponding to this nitro-olefin was unsuccessful. Nitro-olefins may exist long enough in tunnels, garages, and other enclosed places to have a biological action. These compounds have a demonstrated pulmonary carcinogenicity, and can be absorbed rapidly through the skin. (Author abstract modified)

7396 APTIC NUMBER 19321

Weber, Ekkehard
ANNUAL REPORT ON AIR POLLUTION CONTROL. VI. (Jahresuebersicht Reinhaltung der Luft (6. Folge)). Text in German. Giesserei (Duesseldorf), 57(11):352-359, May 21, 1970. 90 refs.

The year 1969 was marked by enormous efforts to promote anti-air pollution measures, and in the Ruhr valley the dust fall was reduced by 15%. A literature survey of articles concerned with air pollution problems in foundries in East Germany is given. Foundries comprise 1% of the East German industry and employ 1.6% of all industrial workers; silicosis is frequent among foundry workers. Numerous articles dealing with air pollution in the working environment are listed. Generally it can be said that not much has been done to provide clean air for the workers in foundries; frequently, nothing has been done beyond opening the doors of the workshops. Average dust emissions by cold blast and hot blast cupolas per ton of iron are approximately the same, and are determined by properties of the coke. Primarily, dust particles in the ranges from 2 to 5 microns, 20 to 50 microns, and 100 to 500 microns are emitted. The operating principles of cyclones, scrubbers, electrostatic precipitators and cloth filters are reviewed.

7397 APTIC NUMBER 21937

Weete, J. D., J. L. Laseter, D. J. Weber, W. M. Hess, and D. L. Stocks
HYDROCARBONS, FATTY ACIDS, AND ULTRASTRUCTURE OF SMUT SPORES. Phytopathology, 59(5):545-548, May 1969. 16 refs.

Paraffinic hydrocarbons and free fatty acids were extracted from spores of four species, representing four different genera of smut fungi, and were analyzed by gas chromatography. The individual compounds were characterized as they were eluted from a chromatographic column by mass spectrometry. The hydrocarbon distribution patterns were distinct for each species analyzed. Alkanes containing an odd number of carbon atoms predominated in

every case. The predominant n-alkane peaks were: C27 for Ustilago maydis, C29 and C31 for Urocystis agropyri, C29 for Sphacelotheca reiliana, and C29 for Tilletia caries. The predominant free fatty acids present in the spores contained an even number of carbon atoms. The predominant saturated fatty acid was palmitic acid, and the predominant unsaturated fatty acid varied for each species. The ultrastructure of the surface architecture of the spores was distinct for each species. (Author abstract)

7398 APTIC NUMBER 19248

Wentworth, J. T.
PISTON AND RING VARIABLES AFFECT EXHAUST HYDROCARBON EMISSIONS. S.A.E. (Soc. Automot. Engrs.) Trans., 77(1):402-416, 1969. 8 refs.

The quench phenomena was examined associated with the system of crevices formed by the piston, bore, and compression rings in the combustion chamber of a single six-cylinder engine, and the crevices were found to be responsible for at least one-half of the exhaust hydrocarbon emission for most conditions of speed and load investigated. This phenomenon is apparently caused by the failure of the flame to propagate into the narrow clearances. Wide variations in exhaust hydrocarbon emissions were traced to the angular position of the top compression ring gap, while at a fixed gap position, equally large changes in hydrocarbon concentrations were correlated with blowby volume as determined by the smallest compression ring gap area. Ring gap position and blowby rate effects persisted throughtout an air-fuel ratio range of 13-21. In some instances, exhaust hydrocarbon concentrations were increased by oil accumulation in the combustion chamber at 1200 rmp and 18 in. Hg manifold depression. A sealed ring-orifice design promises to reduce hydrocarbon emissions by minimizing the crevice effect, as modification of piston and top ring cuts blowby below that possible with production rings.

7399 APTIC NUMBER 19400

Wiener, Howard A., Robert P. Bartell, Thomas L. Hess, and Kenneth W. Ports
ATMOSPHERIC SAMPLING STUDY OF NF ROCKET PROPELLANT, REDSTONE ARSENAL, HUNTSVILLE, ALABAMA, 26 MAY-16 JUNE 1969. Army Environmental Hygiene Agency, Edgewood Arsenal, Md., Rept. 99-003-69/70, 32p., Nov. 14, 1969. 2 refs.
CFSTI, DDC: AD 699360

A field study was conducted at Redstone Arsenal, Huntsville, Alabama to measure the concentration of and determine areas of exposure to total fluorides in the exhaust cloud of statically fired six pound motors utilizing a developmental NF propellant. Results of the study gave strong indications that only areas exposed to the visible exhaust would be contaminated by fluorides. The study results also indicated that all fluorides in the exhaust were predominantly in the gaseous state. Areas of greatest exhaust cloud total fluoride concentration were found to be at the approximate location where the cloud was initially formed. In the firing tests conducted, exposure to the cloud at any point within its path was determined to be less than one minute in all cases observed. It was estimated that areas at distances greater than 150 meters from the firing point of the six-pound motors would not be significantly exposed to fluorides from the exhaust. (Author abstract)

7400 APTIC NUMBER 19207

Adams, Clark E. and William T. House
HYDRODESULFURIZATION OF PETROLEUM RESIDUUM. (Esso Research and Engineering Co., Elizabeth, N. J.) U. S. Pat. 3,509,044. 5p., April 28, 1970. 6 refs. (Appl. June 26, 1967, 10 claims).

A process for the desulfurization of petroleum residuum is described. It is carried out at nondestructive hydrosulfurization conditions by contacting the residuum with a high activity catalyst, consisting essentially of a cobalt or nickel salt, which has a support material consisting of silica-aluminum and is characterized by a maximum pore volume and surface area in pores of 30-70 A in diameter. The critical quantity of silica in the catalyst support greatly improves catalytic activity and maintenance. Because of the improved catalyst, this method offers an economic advantage over previous desulfurization processes.

7401 APTIC NUMBER 19634

Ahlqvist, Harald
METHOD OF SEPARATING SULPHUR FROM SULPHUR DIOXIDE. (Assignee not given.) U. S. Pat. 1,955,722. 3p., April 24, 1934. (Appl. Oct. 7, 1931, 8 claims).

An improved method and apparatus for treating sulfur dioxide gases to recover elemental sulfur are described. A continuous cycle of operation is maintained by reacting hydrogen sulfide with SO2 in a mixing chamber to produce water vapor and sulfur. These products are cooled by a water spray, and the volatile components are exhausted from the mixing chamber. The sulfur is dried, and 2/3 of it is reacted with a hydrocarbon oil such as common fuel oil at a high temperature to produce H2S. The H2S is sent to the mixing chamber to react with additional SO2. The other third of the sulfur is saved for use or sale.

7402 APTIC NUMBER 19815

Aliev, G. M. A., A. F. Gonik, A. A. Krasnopol'skii, and V. D. Suzdal'tsev
DUST EXTRACTION PLANT BEHIND A ROTARY KILN FOR BURNING DOLOMITE. Refractories (USSR) English translation from Russian of: Ogneupory, no. 9:539-543, Sept. 1969. 5 refs.

Waste gases from a kiln used to burn enriched dolomite are fed at 600-700 C to a dust chamber and then to a waste-heat boiler, where gas temperatures are reduced to 180-220 C. The flue gases are then passed through a two-stage extraction plant consisting of two battery cyclones and an electric filter. For all working cycles of the filter, dust taken from the electrodes of the filter apparatus is shaken off satisfactorily when the kiln is heated by natural gas. However, the efficiency of the filter diminishes, and the collection of dust from the electrodes is impaired, when the kiln is heated with highly sulfurous oil. To guarantee a stable electric cycle on the filter, natural gas must be added to the flame when operating the kiln on oil. The cyclones can be protected against the abrasive properties of dolomite dust by reducing specific gas velocity to 3.5-4.0 m/sec.

7403 APTIC NUMBER 21760

Altman, Manfred
THE ELECTRIC AUTOMOBILE-A DISCUSSION OF STRATEGY, TACTICS, AND LEADERSHIP. Preprint, Pennsylvania Univ., Philadelphia, Inst. for Direct Energy Conversion, 10p., 1969 (?).

The development of an electrically powered vehicle is likely to affect a substantial portion of our economy. The stakes involved are high, and it is clear that activities relating to the electric auto are increasing exponentially. A danger exists that this sudden frenzied activity may cause harm and waste unless it is channelled in the right direction. The interplay between the national segments which are most concerned are analyzed, namely the federal government as representing the public, the automobile manufacturers, the electric power sources, developers, the space agencies concerned with technological 'spin-off', the academic community, the regional and city planners, the labor unions, and the petroleum industry. The logical sources of leadership are explored and the required strategy and tactics which may help to minimize wasted resources, and which may help to maximize the potential benefits of this technological advance are defined. (Author abstract)

7404 APTIC NUMBER 19368

American Foundrymen's Society, Des Plaines, Ill.
CASE HISTORIES OF ACTUAL AIR POLLUTION CONTROL INSTALLATIONS. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 9, p. 60-64.

Results from 66 replies to a questionnaire on experiences with dust collection equipment for metal melting operations are summarized for electric furnaces and cupolas. A roof-mounted hood with baghouse was a five to one choice over the roof cap with baghouse as a method of collecting furnace fume. Comments about baghouse performance on cupolas were generally good. The survey disclosed that the purchase price given in the supplier's proposal bears no relationship to the turn-key cost; the latter cost, not the FOB price, is the price a foundryman must pay to comply with an air pollution regulation. A detailed description is given of a wet type cupola collection system.

7405 APTIC NUMBER 19367

American Foundrymen's Society, Des Plaines, Ill.
OPERATING METHODS IMPROVEMENTS. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 8, p. 57-59.

Reduction improvements for foundry air pollution by modification of existing production methods and equipment are outlined; nine procedures for improvements in cupola melting methods are suggested. In addition, hot briquetting of scrap metals, at

temperatures up to 1500 F, reduces the contaminant content of flue effluent eliminating smoke and dust. Combustion devices can also be of value. The catalytic combustion process permits completion of oxidation of the contaminants to odor-free, color-free, nonobjectionable gases; since an oxidation reaction is involved, the applicability of the process is confined to combustible fumes, gases, vapors, and mists, such as the exhaust from core ovens, paint ovens, or oil, wax, and resin vaporizing operations. Completion of oxidation of combustible contaminants can also be accomplished by direct heating without catalysts by the use of afterburners, although at present, burner ignition of the cupola exhaust gases is the only practical application of afterburners in the foundry. Nonferrous melting method improvements, and disposal of dry dusts from dust collectors, are briefly discussed.

7406 APTIC NUMBER 19103

American Gas Association, Inc., New York, Liquefied Natural Gas Committee
STORAGE. In: LNG Information Book July 1968. Chapt. 3, p. 34-97, 1968.

Current techniques for storing liquefied natural gas are reviewed. A detailed description is given of such aspects as materials and methods of construction, influence of site characteristics, thermal considerations, operating techniques, maintenance, advantages and disadvantages, laboratory and field testing, and codes and standards. The four techniques discussed are: (1) mined caverns in various rock formations and solution cavities in rock-salt formations; (2) cryogenic inground storage (frozen holes) in which a pit is excavated in water-saturated soil or rock by first freezing a ring of soil with refrigerant circulated through a series of buried concentric pipes; (3) pre-stressed concrete tanks aboveground, at grade, belowground, or partially belowground, for low-cost large-volume storage; and (4) aboveground double-wall metal tanks.

7407 APTIC NUMBER 19269

Arnold, Orlan M., Victor W. Hanson, Robert MacDonald Jamison, Emil Umbricht, and Nicholas J. Panzica
PROCEDURE AND APPARATUS FOR PURIFYING A GAS CONTAINING POLLUTANTS. (Procede et appareil pour epurer un gaz pollue). Text in French. (Ajem Labs., Inc., Livonia, Mich.) Swiss Pat. 480,861. 8p., Dec. 31, 1969. (Appl. Oct. 13, 1967, 35 claims).

A polluted gas is saturated with a liquid in the form of a vapor; the vapor is condensed; the gas and the condensed vapor are passed through an atomized washing liquid; and the condensed vapor is separated from the washed gas. This is accomplished in a chamber equipped with a device for saturating the polluted gas with a liquid and a device for condensing the vapor thus obtained, so that the pollutant particles become agglomerated. A device located within the chamber traps some of the pollutants; another device separates pollutants from the condensed liquid. After the gas has passed through this initial stage of purification, it later passes through a more conventional device, in which additional pollutants are removed from the gas. The importance of the new procedure and device is its ability to remove extremely small particles, of the type that would escape the conventional purifiers.

7408 APTIC NUMBER 19271

Arnold, Orlan M., Victor W. Hanson, Frederick W. Koepke, Jr., and Nicholas J. Panzica
PROCEDURE AND APPARATUS FOR PURIFICATION OF A POLLUTED GAS. (Procede et appareil d'epuration d'un gaz pollue). Text in French. (Ajem Labs., Inc., Livonia, Mich.) Swiss Pat. 476,509. 9p., Sept. 30, 1969. (Appl. Oct. 13, 1967, 17 claims).

A method for purifying waste gases, emitted by a cupola furnace consists of passing the waste gas over an atomized washing liquid, compressing the washed gas, and separating the washing liquid from the compressed gas. This is accomplished by means of an apparatus containing two condensers, to which the waste gas is introduced simultaneously and in which the atomized washing liquid captures the pollutants contained in the gas. Droplets emerging from the two condensers are captured by an eliminator. Compression of the liquid after it has condensed around the particulate material in the waste gas causes the tiny droplets to coalesce into larger ones which are more easily eliminated. This increase in pressure also increases the efficiency of removal for corrosive gases, since they are rendered more soluble by the increase pressure. A fan placed upstream from the eliminator drives the air through the device. Its location at this point enables it to be self-cleaning. Each of the two condensers is equipped with a separate bypass, which permits regulation of the amount of air passing through each, which in turn permits adaptation to changing quantities of fumes coming from the cupola of the furnace.

7409 APTIC NUMBER 19034

Austin, H. C. and P. Sedor
COMBUSTION SCHEME CUTS POWER PLANT SMOG COMPONENT. Elec. World, no. 8:51-53, Feb. 19, 1962.

In a search for ways to reduce power plant contributions to smog in the Los Angeles area, two-stage combustion helped considerably with the nitrogen oxide emissions from some types of boilers. By limiting combustion air through the burners to 90% of the theoretical and introducing the remainder of the air through auxiliary air ports in the front wall above the top row of burners, nitrogen oxide concentration in the stack discharge was cut 40% at full load, burning either gas or residual fuel oils. Concentrations formed in power plant boilers depend primarily on the peak temperatures reached during combustion and, to some extent, on the rate of cooling of the combustion gases. From thermodynamic considerations, a reduction in peak temperature from 3700 to 3600 F can reduce the nitric oxide concentration by a third.

7410 APTIC NUMBER 21944

Bacon, J. R. and K. S. Daly
AN EFFICIENT SCRUBBING COLUMN FOR EFFLUENT GASES. Chem. Ind. (London), no. 21:686, May 23, 1970.

Hydrogen sulfide evolved in a reaction vessel can be safely disposed of by reacting it with aqueous sodium hydroxide solution in a water-cooled glass column packed with glass tubing. The column is attached to the center neck of a three-necked flask, the capacity of which is approximately twice the volume of 5-10% aqueous sodium hydroxide solution required to absorb the total amount of effluent hydrogen sulfide. A second neck of the flask is attached to a mercury pressure head. A dip-leg is fitted through the third neck and connected to an air-driven peristaltic pump, eliminating the possibility of leakage. Gas is admitted to the column through a side arm. By suitable choice of an absorbent the apparatus can be used for other toxic or hazardous gases.

7411 APTIC NUMBER 19633

Bacon, Raymond F.
PRODUCTION OF ELEMENTAL SULPHUR FROM HYDROGEN SULFIDE AND SULPHUR DIOXIDE. (Assignee not given.) U. S. Pat. 1,807,583. 4p., June 2, 1931. (Appl. April 13, 1927, 9 claims).

Improvements in the procedure of reacting hydrogen sulfide and sulfur dioxide to produce elemental sulfur are described. Hydrogen sulfide and SO2 will combine to form elemental sulfur and water. In practice, the course of the reaction is erratic, and it is difficult to obtain a smooth reaction because of various side reactions. The present reaction takes place smoothly and completely if it is conducted under pressure. It can also be promoted and accelerated by violent agitation of the reacting gas. Five to 10 atmospheres of pressure are satisfactory. Optimum agitation is obtained by a rapidly whirling paddle. This process is particularly advantageous when the H2S or SO2 is contaminated or mixed with other gases. A diagram of the apparatus used for the process is included.

7412 APTIC NUMBER 19414

Bacon, Raymond F.
RECOVERY OF SULPHUR FROM IRON PYRITES. (Assignee not given.) U. S. Pat. 1,782,226. 4p., Nov. 19, 1930. (Appl. April 13, 1927, 5 claims).

Iron pyrites are subjected to the action of steam at an elevated temperature in at least one of a group of synchronized retorts, thus converting a part of the sulfur content of the pyrites into hydrogen sulfide. The residual iron sulfide resulting from a partial removal of sulfur from iron pyrites in a separate one of a group of retorts is further roasted to producing sulfur dioxide. The SO2 and H2S from these synchronized processes are reacted in a common condenser, bringing about the formation and condensation of elemental sulfur.

7413 APTIC NUMBER 19560

Bacon, Raymond F. and Isaac Bencowitz
RECOVERY OF SULPHUR. (Assignee not given.) U. S. Pat. 1,917,685. 5p., July 11, 1933. (Appl. July 29, 1930, 8 claims).

A method for producing elemental sulfur from the sulfur dioxide contained in roaster or smelter gases is described. It has been proposed to recover elemental sulfur from SO2 by passing the gas through beds of incandescent coke. This process, however, had little commercial success due to technical and economic problems. With proper control of the temperature of the reacting materials, the rate of gas flow, and other factors, a high yield of elemental sulfur can be obtained by treating smelter gases with reducing gases or powdered coal. The gas is led to a reaction chamber where preheated reducing gases are maintained at a temperature of approximately 1000 C or above. Exothermally reacting gases are rapidly passed through the reaction chamber to help maintain the temperature while the exit gases are rapidly cooled to below 500 C to inhibit the formation of sulfur compounds. Elemental sulfur is condensed and separated from the cooled gases. The residual gases are contacted with a material that will promote the oxidation of hydrogen sulfide and carbon oxysulfide to elemental sulfur.

7414 APTIC NUMBER 19562

Bacon, Raymond F.
RECOVERY OF SULPUR FROM ROASTER GASES. (Assignee not given.) U. S. Pat. 1,934,874. 3p., Nov. 7, 1933. (Appl. May 6, 1927, 2 claims).

An improved method for reducing the sulfur dioxide in roaster gases to elemental sulfur is described. Sulfur dioxide may be reduced to elemental sulfur by high temperature treatment with reducing agents. When using roaster gases as the source of SO2, the dilute nature of the gases and the low content of SO2 make a commercial practice impractical. When roasting is conducted under a pressure of 4 to 5 atm, the gases become enriched in SO2. All of the sulfur may be recovered as elemental sulfur if the gases still under pressure are passed directly to the reducing furnace, where they are contacted with heated reducing agents, and the reduced gases condensed under pressure. When condensation is conducted under the same pressure as the other two steps of the process, the sulfur condenses more readily and cleaner, and better separation and recovery of the sulfur can be made.

7415 APTIC NUMBER 19416

Baehr, Johannes
APPARATUS FOR MANUFACTURE OF SULPHUR. (Assignee not given.) U. S. Pat. 2,835,559. 5p., May 20, 1958. 7 refs. (Appl. Jan. 28, 1954, 6 claims).

An apparatus for manufacturing sulfur is described which consists of a number of contact layers adapted to produce sulfur from

hydrogen sulfide and sulfur dioxide, conduits for conducting the H2S-SO2 mix through the layers in succession, and by-pass components for conducting the mixture selectively through the individual layers so that at least one may be by-passed during the reaction. Thus, part of the contact or catalyst reaction component can be repaired when necessary without removing it. The conduits are located entirely or partly within the contact chamber, and the gases within can be cooled, by spraying superheated water or liquid sulfur into the conduits, or heated by providing burners for the combustion of the H2S or other gases. The temperature can also be regulated by built-in coolers or heaters. The conversion of H2S to sulfur is achieved by burning a part of the H2S and conducting away the heat through a boiler. A partial current of the hot gas can also be conducted away from the boiler for use in heating the gas in the connecting conduit between the two contact bodies.

7416 APTIC NUMBER 19317

Bares, J., J. Marecek, K. Mocek, and E. Erdos
KINETICS OF THE REACTION BETWEEN THE SOLID SODIUM CARBONATE AND THE GASEOUS SULPHUR DIOXIDE. III. STUDY IN AN INTEGRAL FIXED-BED REACTOR. Collection Czech. Chem. Commun. (Prague), 35(6):1628-1640, June 1970. 9 refs. PART II. Ibid., vol. 34:919, 1969.

The reaction rate between solid sodium carbonate and sulfur dioxide was studied at a partial pressure of 0.5-1.0 Torr in an integral fixed-bed reactor at a temperature of 150 C and space velocities of 100,000/h. By using the results of the mathematical treatment of the integral reactor derived previously, the values of the rate constant of a kinetic equation were derived from experimental results, where the reaction rate is a function of the partial pressure of sulfur dioxide and the degree of conversion of sodium carbonate. With the sodium carbonate prepared by thermal decomposition of the sodium hydrogen-carbonate in a nitrogen stream and with a gas containing water vapor at a partial pressure of 15.4 Torr in addition to the sulfur dioxide and nitrogen, the value of the effective rate constant was obtained. (Author abstract modified)

7417 APTIC NUMBER 21895

Barrett, R. E., J. W. Moody, H. P. Hazard, A. A. Putnam, and D. W. Locklin
RESIDUAL FUEL OIL-WATER EMULSIONS. (SUMMARY REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., NAPCA Contract PH 86-68-88, Task Order 16, 82p., Jan. 12, 1970. 37 refs.
CFSTI: PB 189076

The development of techniques for the preparation of emulsions of No. 6 residual fuel oil and water is described. Also included is the preliminary design of a combustion test rig for studying the combustion of heavy oils and emulsions and pollutant emission produced by burning these fuels. Stable emulsions containing up to 30% water, by weight, were prepared from 9 samples of residual fuel oils. No emulsifying agents were required as the oils apparently contained natural emulsifiers. Emulsions containing basic additives were also prepared. The emulsions did not appear to break during atomization. Data on certain important properties, particularly viscosity, are included. The preliminary design of the combustion test rig showed that a rig could be constructed to operate with either combustion intensity or pressure drop comparable to that of a full-scale unit. This can be accomplished by varying the firing rate from 1.5 gph for constant combustion intensity firing to about 8.0 gph for constant pressure drop firing. A variable swirl-type burner was designed to provide the flexibility needed for this range of combustion conditions. (Author abstract modified)

7418 APTIC NUMBER 19466

Baum, Kenneth M.
RECOVERY OF SULPHUR. (United Verde Copper Co., Clarkdale, Ariz.) U. S. Pat. 1,917,689. 2p., July 11, 1933. (Appl. Sept. 25, 1929, 13 claims).

Elemental sulfur is produced by reacting hydrogen sulfide and sulfur dioxide gases in the presence of enclosed porous beds of a granulated composite catalyst consisting of particles of activated carbon which adsorbs H2S more readily than SO2 impregnated with a mineral gel or artificial zeolite which adsorbs SO2 more readily than H2S. The reaction is initiated at atmospheric temperatures. The elemental sulfur is deposited on the catalyst and the activity of the catalyst is gradually impaired, eventually requiring replacement. In preparing the catalyst, a ratio of about two parts by weight of carbon and one part by weight of gel produces good results.

7419 APTIC NUMBER 19587

Baum, Kenneth Michael
RECOVERY OF SULPHUR. (United Verde Copper Co., Clarkdale, Ariz.) British Pat. 369,958. 3p., March 29, 1932. (Appl. Sept. 25, 1930, 10 claims).

A process for recovering sulfur by promoting a reaction between sulfur dioxide and hydrogen sulfide is described. This reaction is accelerated in the presence of a mixture of activated carbon, which adsorbs H2S, and a mineral gel such as an artificial zeolite or silica gel, which adsorbs SO2. In preparing a mixture of activated carbon and a mineral gel, finely divided carbon is mixed with a solution of one of the components of the gel, and then the other component is added and the mixture allowed to gel. The catalyst is washed and dried at a low temperature and granulated to provide particles of the desired sizes. The H2S and SO2 may be obtained from any desired sources. The granulated composite catalyst is formed into porous beds and a mixture of the two gases is passed through the beds in series. The reaction is initiated at atmospheric temperature, producing elemental sulfur and water vapor. The sulfur is deposited on the catalyst whose activity is gradually impaired. When the catalytic activity is impaired to such an extent that the reaction is uneconomical, the sulfur-laden bed is cut out of series and a new one inserted. The elemental sulfur may be removed from the catalyst by steam or superheated water, or by a suitable solvent for sulfur.

7420 APTIC NUMBER 19566

Bedue, M.
SOME CONSIDERATIONS ON CYCLES FOR THE LIQUEFACTION OF METHANE. (Quelques considerations sur les cycles de liquefaction due methane). Text in French. Intern. Inst. Refrig., Comm., vol. 3-5:55-65, Sept. 1960

Several cycles for liquefying methane are compared at 113 K. After a brief review of the main types of cycles, cascade cycles such as ammonia, ethylene, methane or propane, ethane, and methane are described in detail. The power required for methane liquefaction can be separated into one part for the refrigeration plant and another for the liquefaction plant. The total power required varies very little with any variation in the ratio between these two parts. Thus, it is worthwhile to increase the refrigeration segment, since this involves normal refrigerating machinery; however, enough power must still be available at the liquefaction plant to operate above the critical point of methane. The concept of the total refrigerating effect of the cycle in relation to the temperatures involved is of use in the design of heat exchangers and operating, pressures. (Author summary modified)

7421 APTIC NUMBER 19452

Belevitskiy, A. M. and G. Z. Davydov
METHOD FOR DETERMINING NUMBERS OF MAINTENANCE PERSONNEL FOR GAS PURIFICATION INSTALLATIONS. (Metodika opredeleniya chislennosti obsluzhivayushego personala gazoochistnykh ustanovok). Text in Russian. Tsvet. Metal., 40(5):49-53, 1967.

A time study was made of maintenance tasks associated with gas purification installations, and empirical relationships are presented for determining the correlation between numbers of purification units serviced and total number of man-hours required. Approaches are then discussed for matching these maintenance requirements with the requisite personnel of appropriate qualification. For up to 5 units, the total number (T) of service man-hours is equal to the number of hours (t) required to maintain a single unit multiplied by 1.2 raised to the power n, where n is the total number of units serviced. With n greater than 5, T is equal to 0.5tn.

7422 APTIC NUMBER 21647

NIPPON KOKKAN KK-KOKO MODEL. BROCHURE DESCRIBING AMMONIA SCRUBBING PILOT PLANT. Translated from Japanese. Belov and Associates, Denver, Colo., 4p., April 22, 1970.

A pilot installation is described which simultaneously controls a very high percentage of emissions of dust particles and 90 to 95% of sulfurous acid gas. The apparatus embodies a wet-type, atmospheric vapor exchange method, in which liquid is poured through an anti-corrosive synthetic net and spreads out to form a film, through which the gases pass with a special contact mechanism. With very little pressure loss, nearly insoluble gases are effectively absorbed. Gas that has been inducted into the tower cannot leave without contacting the treated solution, and since it makes contact repeatedly, the gas absorption rate is greatly improved. Because pressure losses are small, the cost of running the gas conduction blower is reduced. Flexibility, ease of operation, and maintenance are improved, and recovery of valuable particulates from the gas stream is facilitated. Applications include use in boilers, high temperature furnaces, control of sulfurous gas from oil-burning fuel systems, odor counteraction, and gas recovery and heat exchange in the chemical and oil industries.

7423 APTIC NUMBER 19378

Benner, Raymond C.
METHOD OF PRODUCING ELEMENTAL SULPHUR. (General Chemical Co., New York) U. S. Pat. 1,773,294. 6p., Aug. 19, 1930. (Appl. Jan. 21, 1927, 16 claims).

A process for reducing sulfur dioxide to elemental sulfur by solid or liquid carbonaceous fuel is described. Processes for reducing SO2 by coal or coke have had difficulties in obtaining a product which is not contaminated with soot or solid carbon particles. The presence of soot also makes the condensing and collecting of elemental sulfur difficult. In the process described, SO2 gas is passed through solid incandescent reducing material or liquid fuels. The composition of the resulting gas is adjusted by adding an oxidizing gas, such as SO2, to provide reacting proportions of reducing gas and SO2. This mixture is burned in a combustion chamber maintained at a temperature of 750-1000 C which contains a porous refractory material. In this way, oxidation of the soot or carbon particles with SO2 and carbon dioxide occurs without oxidation of the elemental sulfur. The gas mixture is cooled and the residual gases are contacted with a catalyst to produce additional elemental sulfur.

7424 APTIC NUMBER 19428

Benner, Raymond C. and Alfred Paul Thompson
METHOD OF PRODUCING ELEMENTAL SULPHUR. (General Chemical Co., New York) U. S. Pat. 1,741,551. 8p., Dec. 31, 1929. (Appl. Jan. 21, 1927, 22 claims).

A method is provided for the rapid and complete reduction of sulfur dioxide, either in pure state or gas mixtures, from roasting and smelting furnaces, and the recovery of elemental sulfur so that the gas leaving the system contains practically no gaseous sulfur compounds. Basically, it consists of mixing the SO2-bearing gas with a non-sulfurous and/or sulfurous reducing gas, or passing the SO2 through incandescent carbonaceous reducing material or a mixture of carbonaceous reducing material and sulfide ore. The composition of the resulting gas is adjusted if necessary by adding SO2-containing gas and interacting these mixed gases while maintaining a temperature above that at which the elemental sulfur produced will be precipitated from the gas

stream, i.e., above about 300 C. The gas mixture is cooled and passed over a suitable catalyst to complete the interaction and to condense the remaining sulfur vapor while maintaining a temperature below that at which sulfur has an appreciable vapor pressure, i.e., below about 200 C.

7425 APTIC NUMBER 19415

Benner, Raymond C. and Alfred Paul Thompson
PROCESS FOR OBTAINING ELEMENTAL SULPHUR AND CATALYSTS THEREFOR. (General Chemical Co., New York) U. S. Pat. 1,773,293. 3p., Aug. 19, 1930. (Appl. June 30, 1926, 7 claims).

A method is described for obtaining elemental sulfur from gas mixtures containing small amounts of sulfur dioxide and hydrogen sulfide. The gas mixture is passed at ordinary temperatures into contact with a catalyst prepared by almost completely dehydrating natural bauxite; the temperature must be maintained below 200 C during the reaction. Dalmation, British Guianan, and French bauxites are particularly active and retain their catalytic activity for long periods. Small quantities of ammonia vapor in the mixture of reacting gases materially hastens the reaction and permits even greater gas speeds than are possible with the solid catalyst alone.

7426 APTIC NUMBER 19289

Berger, Heinz
APPARATUS FOR THE CATALYTIC REMOVAL OF NOXIOUS SUBSTANCES FROM ENGINE EXHAUSTS GASES. (Assignee not given.) U. S. Pat. 3,503,716. 6p., March 31, 1970. 3 refs. (Appl. Oct. 31, 1966, 1 claim).

A device for the catalytic oxidation of automotive exhausts is described. In other devices, a reaction chamber contains a catalyst which promotes the oxidation of the combustible components of exhaust gases. Thus, residual hydrocarbons are converted to water vapor and carbon dioxide, carbon monoxide is converted to CO2, and hydrogen is converted to water vapor. However, these devices are not able to sustain a wide range of gas input rates and thus cannot compensate for changes in engine speed. Also, the catalyst chambers have caused engine redesign problems, involved high equipment costs, and made replacement or repair difficult. The device described has a low cost, a high gas-treatment efficiency, and can be easily accommodated in the engine area. The gas is first passed throught a pre-igniting compartment, then contacted with a metal oxide catalyst and secondary air for oxidizing its combustible components. The catalyst chamber is surrounded by a preheating compartment so that the incoming exhaust and secondary air are brought to a higher temperature for the catalyst reaction. Temperature controls regulate the supply of secondary air and the operation of the pre-heating compartment so that a temperature of 700-800 C is maintained in the catalyst chamber.

7427 APTIC NUMBER 19571

Berindan, Cornelia
ATMOSPHERIC POLLUTION INTERRELATION AND GREEN SPACES AS A PROTECTIVE PRINCIPLE OF INDUSTRIAL TOWNS. (Interrelation pollution atmospherique et espaces verts en tant que principe protecteur des villes industrielles). Tribune CEBEDEAU (Centre Belge Etude Doc. Faux), no. 301:143-153, July-Sept. 1969. 59 refs. Translated from French. Belov and Associates, Denver, Colorado.

The protection of residential areas from air pollution due to industrial sources, by means of green plantings, is discussed. Plants intended for such protective zones should be resistant species and they should act on the atmosphere. The pollutants known for their phytotoxic properties are presented in tabular form. The action of plants on air polluted by dusts consists of decreasing the wind speed, collecting the dust on the leaves, and acting on the local air movement. The plants found to be resistant to pollutants are also listed in tabular form. The retention of sulfurous gas, fluorine, hydrogen sulfide, and nitrogen oxides has been established. A correlation between the type and concentration of the pollutant and the degree of plant resistance is needed when managing green spaces for sanitary protection. For each situation, the degree of toxicity of the pollutants should be known in order to choose species with a specific resistance. Plantings with an aerated structure, obtained by grouping wind breaks or rows of trees, retain dusts and gaseous pollutants better than compact areas. Methods which are recommended for determining the form of future protective zones include zoning the values of pollutants obtained by ground studies, mathematical processes based on the laws of pollutant dispersion, and graphic processes.

7428 APTIC NUMBER 19389

Beuschlein, W. L. and Milton Austin Porter
SULPHUR DIOXIDE OVER ALL ABSORPTION. TAPPI, vol. 111:43-46, Dec. 19, 1940. 10 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Fall Meeting, Seattle, Wash., Aug. 20-23, 1940.)

The effect of dissolved calcium bisulfite upon the resistance of the liquid film to the transfer of sulfur dioxide at the gas-liquid interface is investigated. The study involves varying the conditions of operation in a vertical, wetted-wall, counterflow, glass absorption unit. Over the range investigated, the presence of combined sulfur dioxide had no effect upon the over-all absorption coefficient. (Author abstract modified)

7429 APTIC NUMBER 19511

Biederman, Nicholas P.
CAN NATURAL GAS HELP US SURVIVE ON A POLLUTED PLANET? Pipeline Gas J., 197(H):46, 48, 50, 52, 54, 56, 59, 60, 62, and 64, July 1970. 16 refs.

The role of the natural gas industry in terms of the overall pollution problem is discussed. The most beneficial use of the existing supply of natural gas is considered. The areas of air,

water, solid waste, and noise pollution are reviewed from a historical perspective through to present problems. Classification of pollution sources and emissions are given, as well as costs of control programs, particularly in fuel substitution and fuel emission control. Domestic pollution, municipal and industrial waste, and thermal pollution are considered. Electric power generation is the largest source of thermal pollution. Even with the total potential reserves, the gas industry cannot supply fuel to everybody in unlimited quantities. It is essential that government, industry, and individuals cooperate to insure that natural gas is used beneficially, rather than simply conveniently.

7430 APTIC NUMBER 19115

Birmingham, B. W., E. H. Brown, C. R. Class, and A. F. Schmidt
VESSELS FOR THE STORAGE AND TRANSPORT OF LIQUID HYDROGEN. J. Res. Nat. Bur. Std., 58(5):243-253, May 1957. 9 refs.

The Dewar vessel for the road and air transport of liquid hydrogen is discussed from the standpoint of designing and mass production, with special emphasis on the 440 liter and 840 liter vessels. The ideal vessel is spherical in shape, but problems with availability of various materials necessitates some adaptation. High vacuum insulation has been found to be more serviceable than a powder such as silica gel, while thermal radiation to the container is reduced by a liquid-nitrogen-cooled radiation shield. The best construction materials for the vessel are austenitic steels, copper, a number of copper alloys, and aluminum, as these do not become brittle at liquid-hydrogen temperatures. Aluminum seems to offer the highest number of advantages, both for the inner shell and for the nitrogen shield. The suspension system presents several problems: it must be resistant to acceleration, shock, and vibration, while not too difficult to assemble, and at the same time able to transmit a minimum of heat. A recent approach is to provide a laminated, multiple-contact system, using stainless steel discs 0.002-0.005 inches thick. Another designing problem is that of making joints that connect aluminum to stainless steel, since their coefficients of expansion are so different. A copper coating has been used for the aluminum as well as ultrasonic or 'friction' removal of the aluminum oxide layer from the aluminum surface, or a copper transition sleeve. More recently, a 500-liter Dewar vessel was designed, using a dish-ended cylindrical tank rather than the spherical container of the 440-liter vessel.

7431 APTIC NUMBER 19874

Bonn, D. E.
WET-TYPE DUST COLLECTORS. Chem. Eng. Progr., 59(10):69-74, Oct. 1963. 3 refs.

Wet-type dust collectors employ various methods and forces utilizing water or other liquid scrubbing media to capture and remove dust, gases, and fumes from industrial process air streams. Wet centrifugal collectors throw the heavier particles against wetted collector surfaces by centrifugal force. The wet dynamic precipitator combines the dynamic and centrifugal forces of a rotating fan wheel to cause the pollutant to impinge on the wetted blades. Cleaning with orifice type collecters relies on the pickup or delivery of large amounts of water to a collecting zone where centrifugal forces, impingement, or collision causes wetting of the pollutant before its removal from the air stream. Venturi scrubbers are used to collect submicron particles. The stresses of the air stream are used to break up water introduced through open supply pipes in the venturi throat. The turbulence is used to disperse and cause impaction with the contaminant within a short time interval. Gas velocities and water quantities can be varied for the size range of the dust or fume. Packed towers are used almost exclusively for removing gases and vapors, and removal relies on the long contact time between the gas stream and the packing. Design, type and depth of packing, gas velocity, and liquid feed rates are varied to meet existing or anticipated conditions. The orifice type, centrifugal and wet dynamic collectors account for over 90% of the commercially marketed wet collectors in the U. S. The degree of collection efficiency, particle size distribution, and the maintenance of the collectors are also discussed.

7432 APTIC NUMBER 19425

Bonsall, H. A.
CHART GIVES SOLUBILITY OF SO2 IN AMMONIUM BISULFITE. Chem. Eng., 68(10):192,194, May 15, 1961.

A chart which gives the solubility of sulfur dioxide in ammonium bisulfite is described. The chart was designed for the pulp and paper industry, but is valuable for other applications. Data on the solubility of SO2 in ammonium bisulfite solutions show that the vapor pressure of SO2 is directly proportional to the concentration of what can be described as the true free SO2; the total SO2 in solution minus that which can be combined with the base as the bisulfite. Plotting SO2 vapor pressure against true free SO2 concentration, and then superimposing a temperature curve on the graph, makes it possible to find any given variable knowing the other two. The points above 25 C were extrapolated by plotting the log of SO2 vapor pressure against the reciprocal of absolute temperature at several values of true free SO2 concentration.

7433 APTIC NUMBER 19559

Boswell, Maitland C.
PROCESS OF PREPARING A CATALYST FOR THE REDUCTION OF SULPHUR DIOXIDE. (Assignee not given.) U. S. Pat. 2,026,819. 2p., Jan. 7, 1936. 1 ref. (Appl. Oct. 27, 1932, 5 claims).

A method of forming a catalyst for the reduction of sulfur dioxide is described. The materials used are selected from the oxides, hydroxides, sulfides, hydrated sulfides, and oxygenated sulfides of metals of the iron group. The metals of the iron group include iron, nickel, and cobalt. The compound is heated at 90-140 C to partly dehydrate it until the greater part of the water has passed off. The material is then exposed to air or oxygen at a temperature insufficient to cause the formation of SO2. Oxygenation gives the material a high power of combination with SO2. The material is now treated with SO2 at a temperature of

100-200 C until approximately saturated with the gas. The mixture is treated with hydrogen and SO2, preferably at a temperature within the range 200-300 C. The catalyst is considered a sulfide of the metal, carrying adsorbed hydrogen sulfide in varying proportions. The hydrogen sulfide is believed to cause the catalytic activity.

7434 APTIC NUMBER 19121

Brandt, Herbert
DUST COLLECTORS, PROBLEMS, NEW FINDINGS AND APPLICATION. (Entstauber, Probleme, Erkenntnisse und Nutzanwendungen). Text in German. Energie (Munich), 20(10):297-302, Oct. 1968. 8 refs.

Since cyclones produce higher centrifugal forces and collect fine dust particles with higher efficiency when their diameter is smaller, many small cyclones were combined to form a multicyclone. The walls of cyclones must be extremely smooth, and to save costs they are usually made of cast iron. Experience has shown that a diameter of 250 mm is required for separation of particles larger than 3 to 5 micron; for gases with low dust concentration but fine particles, a cyclone diameter of 175 mm is recommended. Agglomerating dusts are more efficiently retained in cyclones than by other techniques. Electrostatic precipitators are particularly suited for separation of dust from acidic and moist gases. For cleaning dry gases they must be twice as large as for moist gases, and conditioning of dry gases is too expensive. In England it was found that the optimum gas speed through these collectors is 2 to 2.6 m/sec. Other experiments with sulfur trioxide injection into the flue gas suggest optimum gas speeds of 1 to 1.6 m/sec. Strongly adherent dusts are better retained at high speeds, low-ohmic dusts at low gas speed. The dust adhering to the collection plates must be removed in intervals. The intervals must be in accordance with the dust deposition which means that the various sections of the collection plates must be cleared with different frequency. Wet scrubbers require high turbulence to ensure good contact between the gas and the cleaning fluid. This usually makes complex equipment necessary. The packed columns belong to the simplest scrubbers. Another simple way of bringing the dirty gas in close contact with the cleaning fluid is to let it impact with water.

7435 APTIC NUMBER 19523

Brandt, H.
DUST REMOVAL FROM BITUMINOUS MACADAM MIX REFINING PLANTS. (Die Entstaubung der Aufbereitungsanlagen fuer bituminoeses Mischgut des Strassenbaues). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:419-426, 1970. 10 refs.

About 50 million tons of bituminous macadam mix is produced annually in West Germany, in 1800-2000 stationary and mobile plants, releasing more than 1 million tons of dust which need to be processed by separators. The mineral constituents, grain size 0-35 mm, are continually dried and heated in a stream of flue gases from a rotary kiln. The finer particles become suspended in this stream of gas and must be removed from it so as to conform to legal regulations. A federal regulation of September 1964 sets the maximum acceptable emission level at 150-750 mg/cu Nm, varied according to the quantity of flue gas. The limit for dust of less than 10 microns is 150-300 mg. A regulation of the Province of North Rhine-Westphalia of October 1967 sets limits according to 5 categories of gas dust content. The dust content of the flue gas depends on the granulometric fineness of the raw material and on the rate at which the gas flows through the kiln. Measurements show that unwashed material produces 150 g/cu Nm, a mixture of washed and unwashed material yields 70 g, and washed material, 40 g. Kilns can be protected against improper packing or overloading, and the supply of gas fed to the kiln can be limited to the amount actually necessary for efficient operation, which will discourage personnel from using improper procedures. Measurements made in 1968 at 13 plants indicate that the type of mineral used has a negligible influence on the amount of dust produced. The present state of technology has no solution for the problem of flue gases containing more than 150 g/cu Nm, which necessitates controlling production procedures in such a way as to keep below this limit. Scrubbers are usually adequate for purification of the emissions, with bag filters or electrostatic filters for especially large plants.

7436 APTIC NUMBER 20803

Braxton, Henry G. and Allen H. Filbey
HYDROCARBON FUEL OR TETRAALKYL LEAD FLUID CONTAINING AN EXHAUST EMISSION REDUCING BISPHENOL. (Ethyl Corp., New York) U. S. Pat. 3,484,218. 6p., Dec. 16, 1969. 6 refs. (Appl. Sept. 18, 1967, 10 claims).

Known methods for reducing hydrocarbon emissions from the exhaust of internal combustion engines bring about an initial reduction in the hydrocarbon emission level but do not prevent the level from rising after the engine has been in service for an extended period with accumulated deposits. The emission increase encountered during engine use and the formation of combustion-chamber deposits are prevented by operating the engine on a fuel containing an alkoxybenzylidene bisphenol such as 4,4-(p-methoxybenzylidene)bis(2,6-di-tert-butylphenol). These same alkoxybenzylidene bisphenols are also antioxidants. (Author abstract modified)

7437 APTIC NUMBER 19253

Breitbach, Fritz and Gustav Choulat
APPARATUS FOR DECOMPOSING AMMONIA. (Carl Still, Recklinghausen (West Germany)) U. S. Pat. 3,505,027. 6p., April 7, 1970. 4 refs. (Appl. June 12, 1967, 3 claims).

A process and apparatus for decomposing or destroying ammonia emanating from coke oven plants or gas works without forming nitrogen oxides is described. The ammonia is decomposed into nitrogen and hydrogen by first heating ammonia-containing vapor clouds to the decomposition temperature of ammonia and then passing the vapor through a decomposition zone. The zone may be in the form of a free space or chamber or may comprise a chamber filled with temperature resistant filling bodies or catalysts of a suitable nature. The apparatus is a furnace housing with an

interior refractory lining surrounding a centrally located combustion chamber and with several first and second passages encompassed by the lining. The advantages of this process is that no oxides of nitrogen are produced.

7438 APTIC NUMBER 19238

Brewer, Charles C. and Charles R. Killian
CATALYTIC HYDROCRACKING AND DESULFURIZATION PROCESS. (Foster Grant Co., Inc., Leominster, Mass.) U. S. Pat. 3,505,209. 8p., April 7, 1970. 3 refs. (Appl. Feb. 20, 1968, 12 claims).

A process for the catalytic hydrocracking and hydrodesulfurization of the distillation residue from the alkylation of benzene and alkylbenzene with ethylene is described. The process converts a large amount of the residue, which has a very low economic value, to valuable aromatic compounds. A mixture of the feed stock and hydrogen is passed through a bed of hydrocracking and hydrodesulfurization catalyst. The composition of the feed stock may vary from 20% to 80% alkylation distillation residue and 80% to 20% styrene distillation residue. The amount of hydrogen should be sufficient to convert the free and chemically combined sulfur to hydrogen sulfide and to saturate the hydrocarbon components. The temperature of the catalyst bed is from 600 to 1100 C. The feed stock is passed through the catalyst bed at a rate of 0.2 to 0.3 lbs feed stock/lb catalyst/hr; the pressure of the feed stock and hydrogen is from 100 to 500 psig. The catalyst may be a mixture of the oxides of molybdenum and cobalt, molybdenum and nickel, or molybdenum, nickel, and cobalt with an alumina carrier. The products of the reaction are H2S and a low viscosity liquid which contains no more than 10 ppm sulfur. The liquid may be fractionally distilled up to 165 C, with the distillate containing benzene, toluene, xylenes, ethylbenzene, methylethylbenzene, and diethylbenzene.

7439 APTIC NUMBER 19606

Burgess, Wilfred Duncan
TREATMENT OF FLUE GASES. (Consolidated Mining and Smelting Co. of Canada, Ltd., Montreal (Quebec)) U. S. Pat. 2,862,789. 8p., Dec. 2, 1958. 8 refs. (Appl. May 17, 1954, 4 claims).

A method of economically recovering sulfur from flue gases which contain very small amounts of sulfur oxides is presented. The process employs ammonium sulfate as an absorbing agent, and involves a series of cooling and concentrating steps and treatment with sulfuric acid. Previously, in applying this absorption process to the treatment of gases from combustion furnaces, a number of difficulties were encountered, such as: high cost of cooling gases to the desired temperature, problems with fly ash acting as condensation nuclei, and evaporation of large quantities of water in order to avoid a very dilute concentration of ammonium sulfate. These difficulties are successfully overcome by the process described.

7440 APTIC NUMBER 19182

Burnett, W. E. and N. C. Dondero
CONTROL OF ODORS FROM ANIMAL WASTES. Trans. ASAE (Am. Soc. Agr. Engrs.), 13(2):221-224, 231, March-April 1970. 17 refs. (Presented at the Winter Meeting of the American Society of Agricultural Engineers, Chicago, Ill., 1968, Paper 68-909.)

A matching-standard method for the evaluation of the ability of commercial odor-control chemicals to mask or eliminate the offensive odor of an animal waste (poultry manure) when added directly to the waste in both laboratory and field tests is described. The lowest concentration of the most effective chemical can be determined. Masking agents and counteractants were the most effective odor-control products, deodorants were moderately effective, and digestive deodorants were least effective. Further research is needed on the effect of repeated applications of odor-control products on soil, so as not to harm the soil for other purposes. (Author conclusions modified)

7441 APTIC NUMBER 19265

Bye-Jorgensen, Jorgen Steen and Gunnar Hartvig Larsen
METHOD FOR WASTE WATER PURIFICATION. (Verfahren zur Abwasserreinigung). Text in German. (Krueger (I) A/S, Kopenhagen, (Denmark) Swiss Pat. 476,646. 3p., Aug. 15, 1969. (Appl. March 18, 1968, 4 refs).

A method was devised for waste water purification which consists essentially of passing the waste water over contact beds of inert material such as slag, stones, shaped concrete parts, etc. The material is piled up loosely in several layers. The contact bed is installed in a chamber adjacent to the aeration chamber. Air is injected into the waste water flow through perforated tubes or nozzles in the aeration chamber. The aeration chamber and the contact chamber are both housed in a common tank. An illustration is given of a tank with asbestos plates forming the contact bed.

7442 APTIC NUMBER 19636

California Dept. of Public Health, Berkeley, Bureau of Air Sanitation
THE EFFECTS OF HYDROCARBON CONTROL ON OXIDES OF NITROGEN EMISSIONS AND AIR POLLUTION. 14p., Jan. 31, 1966. (Prepared in compliance with House Resolution 567, 1965 Regular Session of the California Legislature.)

The effects of crankcase and exhaust control systems on nitrogen oxides emissions are discussed. Crankcase control devices are effective in controlling the gasoline vapors emitted, and are not expected to increase the emission of nitrogen oxides. Hydrocarbon and carbon monoxide control devices have been tested for their effects on nitrogen oxides emissions, and no significant increases were found due to their installation. The test vehicles used by automobile manufacturers were new cars, adjusted according to the manufacturers' specifications. After they are released to the public, these adjustments may not remain within

specifications, and emission characteristics may change. Based on experimental evidence, anticipated hydrocarbon control alone will reduce ozone concentrations in the atmosphere, reduce the severity of eye irritation, minimize plant damage, and improve visibility. The control of CO will reduce the current high levels of this contaminant in the atmosphere. Devices for these two contaminants are available and being installed on motor vehicles. Control systems for nitrogen oxides have not been developed and it may be a number of years before they become available.

7443 APTIC NUMBER 19916

Canovali, L. L. and S. Suda
CASE HISTORY OF SELECTION AND INSTALLATION OF A KRAFT RECOVERY ODOR-REDUCTION SYSTEM. TAPPI, 53(8):1488-1493, Aug. 1970. 11 refs. (Presented at the Conference of the Technical Association of the Pulp and Paper Industry, Alkaline Pulping, Jacksonville, Fla., Oct. 14-17, 1969.)

The reasons behind the selection of certain pollution control equipment for a kraft recovery odor-reduction system are presented. The processes responsible for the various emissions are described, and the principles of operation of the control equipment and control processes are discussed. The pollutants of concern are hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. The primary considerations in designing the control system involved elimination of the direct-contact evaporator and burning of unoxidized black liquor directly in the kraft recovery furnace. A lime kiln and chemical recovery unit are provided to incinerate malodorous gaseous compounds from all mill sources, with an electrostatic precipitator to control particulates.

7444 APTIC NUMBER 19019

Cantor, Stanley
EVALUATION OF THE CHEMICAL THERMODYNAMICS IN THE REPORT, 'APPLICABILITY OF METAL OXIDES TO THE DEVELOPMENT OF NEW PROCESSES FOR REMOVING SO2 FROM FLUE GASES.' (BY TRACOR CORPORATION AND SUBMITTED TO THE NATIONAL AIR POLLUTION CONTROL ADMINISTRATION). Oak Ridge National Lab., Tenn., Reactor Chemistry Div., NAPCA/AEC interagency Agreement 40-183-69, Task Order 1, 42p., Oct. 15, 1969. 25 refs.
CFSTI: ORNL-TM-2744

A large body of thermodynamic information that was compiled and generated in the course of a study of the applicability of metal oxides to the removal of sulfur dioxide from flue gases was evaluated. Five areas were evaluated: adequacy of literary sources, soundness of methods used, reliability and accuracy of data generated, conclusions and recommendations reported, and deficiencies/improvements necessary to make the study sound under intense scrutiny. The literary sources, methods, and conclusions and recommendations met with the approval of the evaluator. The accuracies of some of the predicted heats of formation were criticized as were the accuracies of some of the entropies. Among the improvements suggested to make the report sound under intense scrutiny were suggestions for improving the accuracies of the entropies for sulfates and sulfites.

7445 APTIC NUMBER 19379

Carpenter, Franklin R.
PROCESS OF OBTAINING SULFUR, ETC., FROM FURNACE-GASES. (American Iron and Steel Alloys Co., Denver, Colo.) U. S. Pat. 925,751. 2p., June 22, 1909. (Appl. March 17, 1906, 2 claims).

A process for recovering sulfur and other substances from furnace gases containing sulfur dioxide and other gases is described. The gas is conducted to a dust chamber where solid particles entrained in the gas are deposited. From the dust chamber the gas is led through a reducing atmosphere, such as a bed of incandescent coke, where the SO2 is reduced. The hot gases coming from the reducing chamber will heat the checkered work, through which they pass, to a high temperature, and any subsidiary sulfides will be decomposed. In the passage leading to the settling chamber, the gases will be cooled and the sulfur will be condensed. Some of the sulfur will settle out in the settling chamber, but most will be filtered out in a bag house.

7446 APTIC NUMBER 19255

Carsey, Eugene A.
DUST COLLECTING PLENUM INSTALLATION. (Kirk and Blum Manufacturing Co., Cincinnati, Ohio) U. S. Pat. 3,509,911. 3p., May 5, 1970. 8 refs. (Appl. Sept. 2, 1966, 1 claim).

An improved and greatly simplified dust collecting plenum is described for handling the projected maximum dust removal requirements of a manufacturing area in a centrally located refuse collecting hopper serving an intermediate number of branch feeder lines. The plenum comprises a hollow, cylindrical pipe engaging a circular upper and a hollow, inverted conical lower portion. A main exhaust pipe connected to the bottom of the lower portion is adapted to discharge into a cyclone dust separator. Branch lines radiate from the upper portion for connection with suitable dust entraining hoods.

7447 APTIC NUMBER 19374

Carter, Bernard M.
PRODUCTION OF SULPHUR. (General Chemical Co., New York) U. S. Pat. 2,208,247. 7p., July 16, 1940. (Appl. June 10, 1935, 6 claims).

A method for reducing the sulfur dioxide, produced in the decomposition of sulfuric acid sludges, to elemental sulfur is described. Carbonaceous residues obtained by the decomposition of acid sludges are very good reactant-reducing agents and allow the reduction reaction to occur at low temperatures. These residues containing volatile matter are also efficient reagent-catalysts for the reduction of SO2. A SO2 gas stream and granulated acid sludge residues are introduced into a

reaction zone. The SO2 reacts with the reducing agent in the residues to produce elemental sulfur. The reaction is controlled so that the volatile matter and fixed carbon of the residues are completely used in the reducing process. Since acid sludge residues usually contain large amounts of volatile matter, the residues are moved with the SO2 through the reaction zone at a slower rate than the SO2, but at a sufficient rate so that only the volatile matter is used in reducing the SO2, and a grade of coke is discharged which is free of volatile matter and suitable for use as a fuel. The design and operation of the reaction chamber are also presented.

7448 APTIC NUMBER 19029

Catchpole, S.
THE CONTROL OF POWER STATION CHIMNEY EMISSIONS. Preprint, Inst. Mech. Engrs. London, 13p., 1968. 11 refs. (Presented at the Symposium of the Institution of Mechanical Engineers, Atmospheric Pollution by Industrial Processes and a Review of Treatment Methods, Oct. 17-18, 1968), Paper No. 5.

The methods which were developed for controlling emissions from electrical power stations are discussed; pollutants associated with flue gas from the combustion of fossil fuels are sulfur dioxide, grit, dust and smoke. Sulfur dioxide may be controlled by an adequately high dispersion level; grit and dust by arrestment at their source; and smoke may virtually be eliminated by proper combustion techniques. A plume emitted high in the atmosphere in a low-level temperature inversion remains aloft and contributes nothing to ambient concentrations at ground levels. The design of a tall chimney for pollution control is included. Principles of electrostatic precipitation have been developed to the extent that dust removal efficiencies in excess of 99% are now attainable. Results of several air pollution surveys with respect to SO2 and dust concentrations are also discussed.

7449 APTIC NUMBER 19602

Charsbury, H. B.
TECHNICAL REPORT ON THE PROGRESS MADE ON THE ELIMINATION OF AIR POLLUTION FROM BURNING REFUSE PILES PROJECT. Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., Anthracite Div., 14p., 1963. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers Meeting, April 1963.)

One of the most serious air pollution problems today is the burning of combustible material in mine refuse piles. To eliminate the pollution, it is sought to remove the source, the combustible material. The resulting separation would yield a clean, non-burning refuse and a low-grade fuel. Progress of research being conducted that will establish the amount and nature of the combustible material contained in the refuse piles and will establish, by special tests, the nature and characteristics necessary to have a non-burning refuse is reported. Samples from anthracite and bituminous coal areas were subjected to sink-float tests in heavy liquids. After the sink-float samples were dried and weighed, they were crushed, ground, and moisture, ash, sulfur, and BTU determinations were performed on all fractions. Three washability examinations were completed on bituminous coal refuse and one on an anthracite coal refuse. The large number of washability results obtained led to the development of a time-saving computer program to make the necessary calculations. Cumulative float and cumulative sink calculations and composite calculations were obtained from direct weight percent, ash, sulfur, and BTU values. A special test was developed to establish the burning characteristics of refuse material. Numerous preliminary tests were performed with an ignition temperature furnace. This included several tests with an inert(limestone). In these tests, information was sought concerning the influence of air flow and size and the degree of reproducibility. Future plans call for an automatic multipoint recorder and a second furnace to permit 24 hour per day operation. The results obtained by the washability studies and by the ignition temperature studies will be used as the basis for the design and lay-out of an experimental mobile preparation plant which will have a capacity of 100 tons per hour.

7450 APTIC NUMBER 19704

Chatigny, M. A., A. A. Sarshad, and G. F. Pike
DESIGN AND EVALUATION OF A SYSTEM FOR THERMAL DECONTAMINATION OF PROCESS AIR. Biotechnol. Bioeng., 12(4):483-500, 1970. 8 refs.

Aerobiology studies at the Naval Biological Laboratory require the use of a vacuum system to provide safe disposal of air contaminated with pathogenic microorganisms. A system for the thermal decontamination of this process air was designed that provides 6-8 in. Hg vacuum in the laboratory and processes 600-1200 scfm of contaminated air by raising air temperature as high as 750 F. Air vented into the system by a vacuum blower is passed through high-efficiency filters and natural gas burning jets to an economizer heat exchanger. After passage through the economizer, the air is directed to a secondary water-cooled heat exchanger designed to protect the exhaust blower from air temperatures exceeding 160 F. Discharge from the blower is directed out through the roof of the building and clear of all occupied spaces. Tests of the system show a reduction in number of aerosolized viable hardy spores (Bacillus subtilis var. niger) of more than 9 logs at design flow rates. The kill rate measured in the system is somewhat higher than those reported by other workers. The annual owning and operating cost of the system is approximately $9000. (Author abstract modified)

7451 APTIC NUMBER 19383

SO2 ABSORBER: TWO SCRUBS BETTER THAN ONE. Chem. Eng., 62(2):132-134, Feb. 1965.

Sulfur dioxide in concentrations as high as 0.9% is effectively removed from sulfuric acid plant fumes in a double scrubbing tower that comprises two separate scrubbers built one above the other. The scrubbing system utilizes ammonium sulfite-bisulfite solutions. Inlet gases pass countercurrent to the first scrubbing solution in the lower scrubber, where most of the sulfur dioxide is recovered. Gas then moves through a chimney to

the upper section, where a weaker solution removes the remaining sulfur dioxide. Tail gases discharged to the atmosphere contain less than 0.3% sulfur dioxide. Ammonium sulfate is recovered as a by-product by passing the solution from the lower scrubber to a stripping tower and reacting it with sulfuric acid from the acid unit. The ammonium sulfate is pumped to an adjacent fertilizer plant.

7452 APTIC NUMBER 19593

Chemical Construction Corp., New York, N. Y., Consulting Div.
A BIBLIOGRAPHY OF REMOVAL OF NITROGEN OXIDES FROM WASTE GASES, EXCEPT METHODS BASED ON REDUCTION AT HIGH TEMPERATURE AND CATALYTIC DE-COMPOSITION, 1907-1968, WITH ABSTRACTS. (PART 4). In: Engineering Analysis of Emissions Control Technology for Sulfuric Acid Manufacturing Processes. Volume 2. Literature Search. Contract CPA 22-69-81, 52p., March 1970. 158 refs.
CPSTI: PB190471

References and abstract from U. S. and foreign sources, including patents, are arranged and indexed by a variety of individual adsorption and absorption control methods, within one of two major subdivisions. Part One pertains to the removal of nitrogen oxides from chamber and Mills-Packard sulfuric acid plant tail gases, while Part Two is concerned with the removal of low concentrations of nitrogen oxides from waste gases.

7453 APTIC NUMBER 19594

Chemical Construction Corp., New York, N. Y., Consulting Div.
A BIBLIOGRAPHY OF SULFUR TRIOXIDE AND SULFURIC ACID MIST EMISSIONS AND THEIR CONTROL, 1907-1968, WITH ABSTRACTS. (PART 3). In: Engineering Analysis of Emissions Control Technology for Sulfuric Acid Manufacturing Processes. Volume 2. Literature Search. Contract CPA 22-69-81, 32p., March 1970. 105 refs.
CPSTI: PB 190471

References and abstracts from U. S. and foreign sources, including patents, are arranged and indexed by subject into seven major categories. These are: sulfuric acid mist formation; physical behavior of H_2SO_4 mists; sulfuric acid mist emissions and their control; mist removal in general; sulfuric acid mist removal; sulfur trioxide removal; and analytical methods.

7454 APTIC NUMBER 19595

Chemical Construction Corp., New York, N. Y., Consulting Div.
A BIBLIOGRAPHY OF SULFUR DIOXIDE REMOVAL AND RECOVERY FROM WASTE GASES AND SULFURIC ACID PLANT TAIL GASES, EXCLUDING THE LIMESTONE AND DOLOMITE INJECTION PROCESSES, 1953-1968, WITH ABSTRACTS. (PART II). In: Engineering Analysis of Emissions Control Technology for Sulfuric Acid Manufacturing Processes. Volume 2. Literature Search. Contract CPA 22-69-81. 58p., March 1970. 223 refs.
CPSTI: PB 190471

References and abstracts from U. S. and foreign sources, including patents, are arranged and indexed by subject within 13 major categories. These are: data on SO2 emissions; toxicity and tolerance of SO2 in the atmosphere; absorption of SO2 in water; absorption of SO2 in inorganic aqueous salt solutions; aqueous slurries; sorption by solid materials; molten salts; aqueous solutions of organic compounds; oxidation of SO2 to SO3; removal of SO2 by reduction; chromatographic separation; general reviews and economic aspects; and bibliographies. Several tables of data on SO2 air pollution are also included.

7455 APTIC NUMBER 19629

Chertkov, B. A.
COEFFICIENTS OF MASS TRANSFER DURING ABSORPTION OF SO2 FROM GASES BY SOLUTIONS OF AMMONIUM SULFITE AND BISULFITE. (Koeffitsienty massoperedachi pri poglcshchenii SO2 iz gazov rastvorami sul'fit-bisul'fita ammoniya). Text in Russian. Zh. Prikl. Khim., 37(11):2437-2455, 1964. 11 refs.

Data are analyzed for the sulfur collecting installation at a thermoelectric station to confirm the validity of calculating the coefficient of mass transfer using a Nusselt number (for gas) of 0.0035Re(gas)Re(liquid) to the 0.4th power (Re is Reynolds number). This value is established as general for all cases of absorption of SO2 by alkaline absorbers. The widely accepted belief that the overall coefficient of mass transfer decreases with increased diameter of the absorption column is not substantiated; it does, however, decrease as the saturation of the absorbing solution increases and approaches equilibrium with the gas being absorbed.

7456 APTIC NUMBER 19323

(Inventor not given.)
METHOD FOR REMOVAL OF ACID GASEOUS POLLUTANTS FROM A GAS. (Verfahren zur Entfernung von sauren gasfoermigen Verunreinigungen aus einem unreinen Gas). Text in German. (Chevron Research Co., San Francisco, Calif.) Swiss Pat. 453,301. 7p. Mar. 31, 1968. (Appl. Dec. 28, 1966, 5 claims).

A method is described for the removal of acid gaseous pollutants, such as hydrogen sulfide and carbon dioxide, from a gas consisting of at least 80% (preferably 90%) ammonia and a small amount of water. It is characterized by scrubbing the gas with concentrated aqueous ammonia solution which is obtained by evaporation of liquid ammonia. The scrubbing process takes place with the temperature between -18 to 38 C and at a pressure of 0.07 to 10.5 atm. Water is added at a speed necessary to maintain a constant mol ratio of ammonia to acid gas of at least 10:1 in the solution. The uncleaned gas should contain more acid gases than water, the cleaned gas more water than acid gases. A packed column or any other device which brings the polluted gas in close contact with the scrubbing liquid can be used as a reaction chamber. Part of the aqueous ammonia solution containing the acid gas must be drawn off to maintain the equilibrium.

7457 APTIC NUMBER 21744

Clarenburg, L. A. and H. W. Piekaar
AEROSOL FILTERS-I. THEORY OF THE PRESSURE DROP ACROSS SINGLE COMPONENT GLASS FIBRE FILTERS. Chem. Eng. Sci., 23(7):765-771, Aug. 1968. 6 refs.

Based on geometrical considerations, a theoretical equation was derived relating pressure drop to filter-and fibre-properties. Theoretical predictions are in satisfactory agreement with experimental results, obtained with single component glass fibre filters having porosities not exceeding 0.94; for higher filter porosities, the present theory should be refined. A quantitative expression of the structure effect, shown to play an important role in optimal filter design studies, is given. (Author abstract)

7458 APTIC NUMBER 21745

Clarenburg, L. A. and F. C. Schiereck
AEROSOL FILTERS-II. THEORY OF THE PRESSURE DROP ACROSS MULTI-COMPONENT GLASS FIBRE FILTERS. Chem. Eng. Sci., vol. 23: 773-781, 1968. 8 refs.

Based on geometrical considerations, a theoretical equation was derived relating pressure drop to filter-and fibre-properties of multi-component glass fibre filters. For a great number of filters, theoretical predictions of the pressure drop are in excellent agreement with the experimental results for filter porosities not exceeding 0.94. These results constitute an indirect proof of the validity of the theory of tortuosity presented in an earlier paper. Considerable gains in aerosol retention can be achieved by minor variations of the composition of a filter, almost without affecting the pressure drop. (Author abstract)

7459 APTIC NUMBER 19472

Clark, Arthur Maurice
RECOVERY OF SULPHUR DIOXIDE FROM GASES. (Imperial Chemical Industries Ltd., London (England)) U. S. Pat. 1,908,731. 1p., May 16, 1933. (Appl. May 4, 1932, 2 claims).

Aqueous solutions of alkali hydroxides or alkali sulfites have been used as solvents for removing sulfur dioxide from gas streams. However, on heating, such solutions do not release their total content of SO2. Therefore, in a cyclic process, the quantity of SO2 recovered per cycle is only a fraction of the total quantity contained in the solvent. The quantity of SO2 recovered per cycle can be increased by adding a substance which imparts acidity to the solvent with an increase in temperature. Aluminum chloride is recommended for this purpose. It undergoes increasing hydrolysis with a rise in temperature, increasing the hydrogen ion concentration, and does not form an insoluble precipitate.

7460 APTIC NUMBER 19437

Commission of European Communities, Luxembourg (Belgium), European Coal and Steel Community
TECHNICAL MEASURES OF DUST PREVENTION AND SUPPRESSION IN MINES. MINE CLIMATE. 55p., 1968. 4 refs.

A program of research and development relating to dust prevention and suppression in mines was initiated in 1960. The current phase of the program, phase 2, is comprised of 72 projects and is scheduled to continue through 1969. This third annual report of the phase 2 program delineates the attainments of selected projects through the end of 1967 and estimates the potential of projects not yet completed. Some of the general topics considered, each involving several projects, include water infusion of the seam, dust control in the use of winning machines, dust control away from the mine face (roads, handling equipment, and transport), measurement of dust, physics of dust, research into the use of salt pastes, mine climate, and pneumoconiosis and environmental factors. Tabular material appended to the text describes the total scope of the programs of industrial medicine, hygiene, and safety being pursued by the Commission of the European Communities as well as listing each of the projects and performing institutions within the scope of the Dust Prevention and Suppression in Mines, Phase 2 program.

7461 APTIC NUMBER 19283

Cornett, Milan S.
CENTRIFUGAL DUST SEPARATOR. (Assignee not given.) U. S. Pat. 3,513,642. 3p., May 26, 1970. 15 refs. (Appl. July 25, 1968, 4 claims).

A centrifugal dust separator is described which consists of a vertical housing with an upper cylindrical part and a lower frustoconical part terminating in a reduced outlet. The upper part has a tangential inlet for the pressurized dust-laden air flow. The size of the inlet can be adjusted to regulate the flow velocity into the annular passage. A helical baffle skimmer is situated in the lower interior of the conical part while a concentric conical screen is located above the baffle. The screen intercepts the dust in a reverse air flow, rising from the baffle, and passes the air flow upward for discharge.

7462 APTIC NUMBER 19457

Cowen, P. S. and D. L. Robertson
ROUNDUP ON AIR POLLUTION. Gray Ductile Iron News, 1967: 19p., Dec. 1967. 6 refs. (Presented at the Gray and Ductile Iron Founders Society Incorporated Annual Meeting, 39th, Scottsdale, Arizona, Oct. 17-20, 1967.)

While admitting the technical possibility of installing highly efficient emission controls on cupolas in iron foundries, data is presented to show that these installations can exceed in cost the net worth of 50% of the industry's plants. Alternatives mentioned include obtaining a non-conformance variance or

replacing the cupola with an undefined emission-free melter. Particular mention is made of the 10-year program in Los Angeles County wherein as many as three different systems were installed on a single cupola during the period in attempts to comply with changing regulations with a system that would not corrode into uselessness within a few years. Costs, principally engineering costs, for these installations on even the smallest cupolas in commercial operation start at $30,000 and quickly rise to the million dollar mark for efficient control of high-tonnage units. To these figures must be added operation and maintenance costs ranging from $2500 annually to $43,200 annually. A twin plea is submitted for reasonable attitudes on the part of regulatory agencies and a pooling of relevant technical data within the industry to permit an industry-wide attack on the problem.

7463 APTIC NUMBER 19052

Cross, Frank L., Jr.
CAN ON-SITE INCINERATION SOLVE A WASTE DISPOSAL PROBLEM AND NOT CREATE AIR POLLUTION? Preprint, City of Elizabeth, N. J. and Rutgers -- The State Univ., New Brunswick, N. J., 10p., 1970. 5 refs. (Presented at the Air Pollution Control Meeting Elizabeth, N. J., 1970.)

The annual production of solid waste in the United States is approximately 140 million tons. The disposal of these wastes each year creates large quantities of airborne pollutants, including one million tons each of carbon monoxide, sulfur dioxide, hydrocarbons, nitrogen oxides, and particulate matter. Between the time that a community runs out of suitable land for sanitary landfill and the time when it can afford to construct a municipal or regional incinerator, on-site incineration is important in the community's waste disposal operations. Poorly designed multiple-chamber units and poorly operated units have resulted in the discharge of large quantities of smoke from single-chamber incinerators. Some state and local control agencies are passing regulations lowering the paticulate emission limit to 0.1 grain/cu foot. Many units will not meet these regulations without installing some type of control device, such as a scrubber or auxiliary burner. Some factors essential to good planning have been suggested by the Incinerator Institute of America; collecting and method of charging, ample space around the incinerator, adequate air supply, adequate draft, chimney location, and current local codes and ordinances.

7464 APTIC NUMBER 19086

Crouse, Gerald O.
VEHICLE EXHAUST EMISSION TEST REPORT. (FINAL REPORT). Olson Labs. Inc., Dearborn, Mich., Proj. 1-1173-1, 12p., March 3, 1970. 1 ref.

A 'Volumetric Intake Manifold Relief Valve' was tested on two automobiles to determine its capability in the control of the automotive emissions carbon monoxide, oxides of nitrogen, and hydrocarbons. The tests consisted of a total of five test runs, two of which were baseline identifications, one for each vehicle. Although one run gave a reading for oxides of nitrogen in excess of the baseline reading, the overall results indicated a general reduction in the quantity of emissions. The largest reduction was in the emission of carbon monoxide based on a comparison of the 'volumetric' configuration and the baseline configuration.

7465 APTIC NUMBER 19927

Daigh, Harold D.
EXHAUST RECYCLE SYSTEM FOR AN INTERNAL COMBUSTION ENGINE. (Atlantic Richfield Co., Phila., Pa.) U. S. Pat. 3,513,816. 5p., May 26, 1970. 5 refs. (Appl. May 20, 1968, 14 claims).

An exhaust recycle system for internal combustion engines is described. The system allows exhaust gas to be recycled from the heat riser into the induction system, and it provides a means of controlling the amount of gas admitted to the heat riser and the amount of gas recycled into the induction system. If too much hot exhaust gas is recycled, the air-fuel mixture may be overexpanded, resulting in a loss of engine power. For this reason it is necessary to control the process. A previous recycling system admitted too much exhaust gas into the induction system, causing poor performance at part throttle and constant speed. Recirculating the exhaust gas helps to control emissions of nitrogen oxides.

7466 APTIC NUMBER 19826

Daiichi Industries Ltd., (Japan)
THE NEW FILTER FOR REMOVING SULFUR DIOXIDE GAS IN THE ATMOSPHERE. (Atarashii taikichu no aryusanqasu josc firuta). Text in Japanese. Kukichowa To Reito (Air Conditioning Refrig.), 9(7):53-54, July 1969.

A new sulfur dioxide filter was developed and basic experiments were conducted with regard to quality assessment. The filter tested consisted of unwoven cloth 100 mm thick treated with an alkaline substance. The faster the intake wind velocity, the lower the rate of SO2 capture. Changes in the external concentration of SO2 does not affect the collection efficiency of the filter. Collection rate goes down with the decrease in relative humidity below 45% and rapidly declines below 30%. Thus, there is an advantage in humidifying the air before filtration, and steaming the filter after prolonged use will restore its efficiency. At 15 ppm SO2 concentration and with 0.5 m/sec intake velocity, the initial collection efficiency was about 99.5%, and the dust collection rate was about 40 - 60% by colorimetric method. The filter is presently undergoing a long-term exposure test in Kawasaki.

7467 APTIC NUMBER 19203

Dancy, T. E.
CONTROL OF COKE-OVEN EMISSIONS. Iron Steel Engr., 47(7):65-75, July 1970. 5 refs.

The status of equipment developments for controlling emissions from coke ovens are reviewed, and studies now in progress are described. Venturi scrubbers control particulate emission but not benzene-soluble compounds. The AISI coke-oven charging system to reduce emissions is described. A component testing program to provide information on ascension pipe steam ejector design, ascension pipe automation, hopper design, feed hopper shut-off, leveling-bar door automation, and lid lifter design is reviewed. Means of controlling emissions during the pushing operation are discussed. The quenching operation can be a significant source of contaminants. It will take considerable time, manpower, and money to reliably control emissions throughout the industry.

7468 APTIC NUMBER 21913

Davies, C. N.
THE CLOGGING OF FIBROUS AEROSOL FILTERS. Aerosol Sci., 1(1):35-39, 1970. 4 refs. (Presented at the Colloquium of l'Institut National de Recherche Chimique Appliquee and the Staubforschungsinstitut, Paris, Nov. 1969.)

Proceeding from empirical formulae relating to penetration, resistance, and time of operation of a filter, expressions are derived which enable the mean penetration, over a period of use, and the amount of aerosol material deposited in a filter to be calculated. Methods of assessing the performance of a filter in terms of two parameters which appear in the expressions are given, with typical examples, and the relationship of the parameters to the filtration index of basic theory is explained. (Author abstract)

7469 APTIC NUMBER 19333

Delzenne, Amand, Raymond Armand Haselin, Michel Marie Jacques Outin, and Claude Paul Rene Pelecier
PROCESS FOR THE RECOVERY OF SULFUR DIOXIDE IN RESIDUAL GASES. (Societe Ugine Kuhlmann, Paris (France)) and Societe Anonyme, Weiritan (France)) U. S. Pat. 3,503,185. 4p., March 31, 1970. (Appl. Dec. 27, 1968, 10 claims).

A process which applies to residual gases or smokes containing 1000 to 5000 ppm sulfur dioxide, improves conventional scrubbing processes in which SO2 is absorbed in aqueous solutions of ammonium sulfite and/or bisulfite. Gases to be scrubbed are first prewashed by an aqueous sulfite lye, the prewashing physically stopping solid particles and removing nitrogen oxides through reaction with the sulfite solution. In addition, the prewashing makes it possible to substantially remove sulfur trioxide, sulfuric acid, or sulfates from the gases and smokes. Prewashing is followed by treatment of the gases at 20 to 55 C with an ammonium salt selected from the group consisting of ammonium sulfite and ammonium bisulfite. Absorption is carried out maintaining the SO2/NH3 molar ratio at 0.7 to 1 and with ammonium salts in concentrations from 300 to 500 g/l. The desorption of SO2 is carried out consecutively at 70 to 75 C and 650 to 700 mm Hg; the SO2/NH3 ratio are the end of desorption so that the solution can be directly recycled.

7470 APTIC NUMBER 19601

Dennis, Richard, Edward Kristal, Glenn A. Peters, and Leslie Silverman
LABORATORY PERFORMANCE OF THE MIKRO-PULSAIRE COLLECTOR (MODEL J-9-6A). Harvard School of Public Health, Boston, Mass., Air Cleaning Lab., APC Contract AT(30-1)841, Rept. NYO 4816 Waste Disposal, 85p., June 15, 1962. 17 refs.

Performance data are presented for a fabric filter (Mikro Pulsaire) continuously cleaned by intermittent reverse air pulses directed into the clean air exit of the filter tube. Tests showed that, at fabric face velocities of 9 ft./min and inlet dust loadings in the range of 1.0 grain/cu ft resuspended fly ash and vaporized silica could be filtered at constant (equilibrium) resistances of 4 and 5 in. water, respectively. No equilibrium resistance could be attained with iron oxide fume. Fabric resistance varied inversely with the square of the compressed air pressure and inversely with the square root of the pulse frequency. Pulse duration had no effect on resistance. Fabric resistance was moderately dependent on dust deposition rate, increasing as the fourth root of the inlet loading. Initial flexing of tubes appeared to be the principal cleaning mechanism. Comparison of the Micro-Pulsaire collector with a Hersey-type blow ring unit indicated that total power requirements were greater for air pulse cleaning. The Mikro-Pulsaire device was less expensive for air handling capacities of 3000 cu ft/ min or lower and more expensive for capacities greater than 8000 cu ft/min. However, the manufacturer's claim that air pulse cleaning reduces over-all maintenance appears reasonable. It suggests that performance and operating costs would be similar for both air pulse and blow ring type devices in many applications. (Author summary modified)

7471 APTIC NUMBER 20049

(Inventor not given.)
PROCEDURE FOR MANUFACTURING AN OXIDATION CATALYST USEABLE AT AN ELEVATED TEMPERATURE, PARTICULARLY FOR PURIFICATION OF EXHAUST GASES OF COMBUSTION ENGINES AS WELL AS PRODUCTS SIMILAR TO THOSE OBTAINED BY THE PRESENT PROCEDURE OR A SIMILAR PROCEDURE. (Procede pour la fabricaton d'un catalyseur d'oxydation utilisable a temperature elevee, en particulier pour la purification des gaz d'echappement des moteurs a combustion, ainsi que les produits conformes a ceux obtenus par le persent procede ou procede similaire). Text in French. (Deutsche Gold- und Silber-Scheideanstalt vormals Roessler (West Germany)) French Pat. 1,467,334. 4p., Dec. 19, 1966. (Appl. Feb. 3, 1966, 10 claims).

A procedure is presented for manufacturing an oxidation catalyst useable at elevated temperatures, particularly for purifying exhaust gases of industrial installations and of internal-combustion engines with air-intake, by means of combustion of impurities which can be oxidized to carbon dioxide and water vapor. This procedure is characterized by the fact that an aluminum oxide is blended with oxides of heavy metals, resulting in a catalyst which keeps its efficacy for a long period of time at elevated temperatures. The Al oxide is blended with such share

of mixed oxides of heavy metals that the proportion of the heavy metals, expressed in terms of the oxides, exceeds 50 weight %, and lies preferably between 55 and 90 weight %. The mixed oxides of heavy metals are blended with one of the following elements: Be, Mg, Ca, Sr, or Ba in concentrations of, preferably, 0.5 to 10 weight %. The mixed oxide of heavy metals is replaced by a combination of at least two metallic components, one of which is Cr and the other is one the following elements: Ti, Va, Mn, Fe, Co, Ni, Cu, or Zn. As a mixed oxide of heavy metals, Cu-Cr oxide is use, either in the form $CuCr_2O_4$, or in the form $CuCrO_2$. The two oxides which are the basic materials are separately prepared in powder form after which they are mixed with a binder to be shaped into small rods or tablets. The final roasting of the catalyst in the temperature interval between 400 and 800 C takes place in an O2 atmosphere. The catalyst is compressed and roasted in such a manner that the tablets have a crushing strength of more than 10 kg per tablet.

7472 APTIC NUMBER 19240

Deynat, Gerard
DEVICE FOR CONTINUOUS EXTRACTION OF ALKALIS FROM THE ESCAPE GASES OF A CEMENT KILN. (Societe des Forges et Ateliers du Creusot, Paris (France) U. S. Pat. 3,503,187. 4p., March 31, 1970. 9 refs. (Appl. Aug. 2, 1968, 1 claim).

A device for the continuous removal of alkalis from the waste gases of cement kilns is described. It consists of an outlet duct for the gases and a curtain formed by a number of metal chains. The two runs of the chains are wound on a return wheel immersed in a tank containing water for washing and cooling the chains. The two tanks have double walls to allow cooling by the circulation of washing and cooling liquid, the temperature of which is maintained at 50-60 C. This accelerates the dissolving of the alkalis entrained by the chains and reduces the effects of thermal shocks. The tanks have hoppers for recovering the dust collected by the chains; the chains pass over glide wheels in the upper part of the hopper, and dust is collected in the lower part. To complete the sealing tightness and to prevent fresh air from entering the ducting, the device can include two pressure detectors in the ducting and casing, respectively. A comparator of the pressures then controls a regulating chain which controls a shutter in the duct for fresh air, so that the duct pressure is always slightly higher than the casing pressure. The air introduced into the casing is evacuated by a fan which draws air through a filter which entrains fine dusts. Larger dust particles, released from the chains by nozzles and brushes, are collected in a recovery hopper situated in the lower part of the casing.

7473 APTIC NUMBER 19024

Dicks, John B., Jr.
LARGE SCALE POWER DEVELOPMENTS. Tennessee Univ., Tullahoma, Space Inst., AFOSR Contract F44620-69-C-0031, 14p., 1969. 3 refs.
CFSTI, DDC: AD 701446

The engineering problems, economics, pollution aspects, and feasibility of technically advanced large-scale central power plants are discussed. Particular emphasis is given to magnetohydrodynamics (MHD) topping of conventional steam plants. MHD power generation is achieved when an easily ionized metal such as potassium or cesium is introduced into high-temperature combustion gas which is expanded to high velocity and directed into a magnetic field with properly arranged electrodes and an external circuit. The principle loss in overall power plant efficiency, currently less than 40%, arises in the heat cycle. The steam cycle used only a relatively small portion of the available temperature range, and a much more efficient cycle might operate by topping the steam cycle with a device that could operate at the flame temperature or above. In the MHD cycle, an increase in flame temperature is necessary to produce the required electrical conductivity. In such a hybrid, the conventional power generating stage would supply less than 50% of the power. The seed material that is contained in the effluent is expensive enough that particulate and vapor removal from the exhaust gas would be mandatory. Overall efficiency of the steam/MHD system lies between 50 and 60%. The cost of nuclear produced electric power has increased from 112 dollars/kilowatt to 160 dollars/kilowatt in the last few years. A comparison of economics for conventional coal-fired, nuclear boiling water reactors, and coal MHD steam systems indicates a possible savings of 70 billion dollars between now and the end of the century through the development of MHD-topped steam plants. The cost of development would be high, probably involving 237 million dollars in order to get through the construction of the first large-scale plant producing 1000 megawatts.

7474 APTIC NUMBER 19546

Dimpfl, L. H., J. E. Goodrich, and R. A. Stayner
EVALUATING ADDITIVES FOR DISTILLATE FUEL OIL-STORAGE TESTS. Ind. Eng. Chem., 48(10:1885-1891, Oct. 1956. 9 refs.

Two test methods for storage stability of distillate fuels are described. The relative effectiveness of fuel additives is determined. A gravimetric method utilizing an asbestos pad filter determines filter residue of fuels. An accelerated aging test determines storage stability by measuring fuel-insoluble material deposited as a function of time. A full scale pumping test to predict screen plugging tendencies is described. Additives may be either metallic or non-metallic. The only way of determining whether a given additive will perform adequately in a given fuel is to test that particular combination. In addition to preventing gums from forming, additives also protect against rust, increase color stability, and improve combustion. Optimum dosages of additives depends upon whether free water is present in the fuel system.

7475 APTIC NUMBER 19279

Dorman, R. G.
REVIEW OF THE DUST CONTROL AND AIR CLEANING EXHIBITION. Filtration Separation (Burley), 6(6):674-678, Nov./Dec. 1969.

The Dust Control and Air Cleaning Exhibition, held in London from September 23 to September 26, 1969, and the accompanying

Filtration Society conference on equipment selection are evaluated. It is remarked that while a wide range of equipment was exhibited, many cleaners operated on similar principles. Among the latter, those with the highest pressure losses are considered likely to have the best efficiencies for small particles. The absence of performance curves for qualitative comparisons between the products of different manufacturers is regretted. Papers read at the conference and the laminar flow systems exhibited, reflect the growing concern with clean room technology. Manufacturers of high efficiency fibrous filters for clean rooms are noted, as are manufacturers of synthetic fibers suitable for high temperature or corrosive conditions.

7476 APTIC NUMBER 19204

Douthit, Walter Harold
MATERIAL OF CONSTRUCTION FOR EXHAUST MANIFOLD REACTOR INNER CHAMBER. (DuPont De Nemours (E.I.) and Co., Wilmington, Del.) U. S. Pat. 3,505,028. 10p., April 7, 1970. 2 refs. (Appl. March 8, 1968, 10 claims).

Construction materials for the inner chamber of an exhaust manifold reactor is described. The material is composed of a non-magnetic, austenitic, iron-nickel-chromium alloy as substrate, and has on substantially all surfaces an aluminum-containing diffusion coating about 1-10 mills thick. This arrangement has the requisite durability to withstand the high and cyclic temperatures and the oxidizing atmospheres present in exhaust manifold reactors while being sufficiently inexpensive that it does not substantially increase the cost of the reactor. Previous reactors were either too expensive to be practical or were unable to withstand high temperatures for a sufficient length of time. (Author abstract modified)

7477 APTIC NUMBER 19228

Drechsel, Herbert, Karl-Heinz Doerr, and Hugo Grimm
METHOD FOR THE CATALYTIC OXIDATION OF SO2 TO SO3 IN SO2 LADEN GASES AND PRODUCTION OF SULFURIC ACID. (Verfahren zur katalytischen Oxydation von SO2 in SO2-haltigen Gasen zu SO3 und Herstellung von Schwefelsaeure). Text in German. (Metallgesellschaft A. G., Frankfurt (W. Germany)) Swiss Pat. 478,712. 4p., Sept. 30, 1969. (Appl. Oct. 25, 1963, 5 claims).

A method for the catalytic oxidation of sulfur dioxide in SO2-laden gases to SO3 with the aid of oxygen containing gases and production of sulfuric acid by absorption of the formed SO3 is described. The SO2-laden gases are heated by heat exchange with the formed SO3 containing gases. The SO2 content in the gases is increased prior to catalytic oxidation by mixing with gases from the combustion of sulfur. The invention pertains to the use of primary gases with an SO2 content at 9% or less by volume. The hot gases from the combustion of sulfur are mixed at least with part of the heated flow of primary gas after it has left the heat exchanger and prior to the entrance into the catalytic oxidation chamber. The sulfur and oxygen quantities must be selected so that the sum of the heat developing at the combustion of sulfur to SO2 plus the heat developing at the oxidation of SO2 to SO3 suffices to compensate for the heat loss suffered at the intermediate absorption of SO3. The sulfur dioxide content of the mixture of primary gas/sulfur combustion gas may not exceed 9% by volume. A branch of non-heated SO2 containing primary gas is added to this gas mixture to obtain a temperature of 440 C (maximum). If the primary gas contains less than 9% SO2, 3 to 4 kg, preferably 3.5 kg, sulfur per 1000 cu m primary gas are burned for each missing percentage and added to the gas.

7478 APTIC NUMBER 19450

Driskell, J. C.
CASCADE SCRUBBER HANDLES SUSPENSIONS. Chem. Eng., 53(12):224, Dec. 1956.

An experimental scrubbing tower is described that will circulate liquid-solid mixtures in addition to straight liquids. The scrubber itself serves as a reservoir for the absorbent, and the pump for the circulation of the absorbent is an integral part of the scrubber. The absorbent is withdrawn from the bottom of the tower through a central draft tube and discharged radially onto a cascade of annular baffles. As it returns to the foot of the tower, the absorbent flows countercurrent to the rising stream of gas. The 75-mm long shell of the scrubber is borosilicate glass; the internal parts, including the 22-in. long draft tube, are stainless steel. In a study involving acidic gases and scrubbing liquids containing abrasive minerals, the scrubber was immersed in a constant-temperature water bath, and operated continuously, for periods as long as a month. Performance was satisfactory.

7479 APTIC NUMBER 19352

Duffy, A. P. and A. J. Shoup
BBL LNG TANK TO USE INTERNAL INSULATION, FLEXIBLE LINER 600,000. Oil Gas J., 64(31):114-118, Aug. 1, 1966. Part II. Ibid., 64(32):52-55, Aug. 8, 1966. 7 refs.

A 1285-bbl model pre-stressed concrete tank for underground storage of liquefied natural gas was constructed to study the feasibility of building a 600,000-bbl commercial tank. The tank was about 20 ft in diameter by 10 ft deep and insulated and lined on the inside to provide safe positive containment of the liquid gas. Liquid nitrogen was used as the test gas in a 15-month experimental program. Experimental data on heat transfer and structural aspects were obtained during cool-down, filling, storage, evaporation, and warmup. The thermal characteristics of the model tank were projected to large commercial tanks by computer simulation based on test results. For comparison, heat-transfer formulas were used to calculate the loss rate and freezing isotherm propagation over a 60-day period when the model tank was full. Measured and calculated loss rates were in close agreement, but the measured isotherm propagation lagged behind the calculated value by about 15%. Similar values were obtained when 3.4% moisture was added to the backfill in computer simulation. As estimated by

calculations which take into account the heat of fusion of ground water, the loss rate and freezing distance of a commercial tank at 4.0 yrs will be 0.054% and 51 ft, respectively. After about 15-20 yrs, the equilibrium will be about 35-40 ft. The experiments also demonstrated the effectiveness of flexible-laminate liner. Measurements of boiloff vapors compared with total integrated heat flux revealed no unattributable losses such as would occur from permeation.

7480 APTIC NUMBER 19356

Duffy, A. P. and J. Daimora
LNG PIPELINES APPEAR TECHNICALLY FEASIBLE. Oil Gas J., 65(19):80-89, May 8, 1967. 13 refs. (Presented at the American Gas Association Distribution Conference, St. Louis, Mo., May 2.)

Modular distance studies were conducted as part of a technical investigation of commercially available materials potentially acceptable for the construction of liquefied natural gas pipelines. The result of the studies is a heat-transfer analysis which gives an indication of the spacing between cooling and pumping stations for various pipe diameters, insulations, and flow rates. The study paid particular attention to mechanical and vacuum insulations. Of the mechanical insulations investigated, urethane-foam had the best combination of thermal performance characteristics, strength, ease of fabrication, and cost. Although vacuum insulations may have higher thermal conductivities, their costs are higher and periodic pumping may be required. The cost of better grade insulation for obtaining increased heat resistance is balanced by savings resulting from the need for fewer cooling stations and subsequent reduced horsepower for cooling. Pipeline materials were evaluated according to fracture toughness, strength, and cost. Data is presented for representative steels, aluminum alloys, nickel alloys, and nickel steels. It is expected that the more expensive materials with low transition temperatures will be required in the coldest region of a line. However, because lower pressures are needed to prevent flashing in the area, thinner wall thicknesses can be used. Derived equations for heat-transfer and power requirements for pumping are included in an appendix.

7481 APTIC NUMBER 20099

Ebersole, G. D. and G. E. Holman
LUBRICANT-CLOSED PCV SYSTEM RELATIONSHIPS INFLUENCE EXHAUST EMISSIONS. SAE (Soc. Automotive Engrs.) Trans., 77(1):417-428, 1969. 22 refs. (Paper 680113.)

Low quality motor oils used in engines equipped with closed positive crankcase ventilation (PCV) systems can cause PCV plugging and substantially higher concentrations of exhaust hydrocarbon and carbon monoxide than high quality motor oils. The increase in exhaust emissions with low-quality motor oil results from deposits in the PCV valve, carburetor venturi, and carburetor throttle body, while high quality oil controls the deposits in these areas. Differences in air and fuel flow in an idling engine with a clean PCV system and in one with a plugged PCV system must be considered in developing an explanation of the way PCV system plugging could increase exhaust hydrocarbon and carbon monoxide emissions. Concentrations of HC and CO at idle increased with progressive plugging of the PCV valve and with accumulation of carburetor deposits, but decreased as the ignition timing was advanced. Compared with hydrocarbon emissions with a clean carburetor, idle emissions were increased by throttle body deposits more than by venturi deposits at low PCV valve plugging levels, while carbon monoxide emissions were increased more with venturi deposits than with throttle body deposits when individually compared with CO emissions obtained with the clean carburetor.

7482 APTIC NUMBER 19075

Eccleston, B. H., B. F. Noble, and R. W. Hurn
INFLUENCE OF VOLATILE FUEL COMPONENTS ON VEHICLE EMISSIONS. Bureau of Mines, Washington, D. C., Dept. of Investigations 7291, 83p., Feb. 1970. 20 refs.

Fuel evaporated from automotive fuel systems, evaporative losses, account for a significant portion of the hydrocarbon air pollutant material from automobiles. The amount of material lost from vehicles through evaporation processes obviously is sensitive to fuel volatility, and, logically, fuel volatility reduction has been suggested as a means of reducing evaporative losses. Volatility reduction would unquestionably reduce the amount of evaporative loss, but technical questions remain to be answered before the overall benefit, if any, could be assessed with acceptable confidence. Two such questions are as follows: (1) what is the effect, if any, of vapor pressure on emissions other than evaporative loss; considering these emissions, what is the overall effect on emissions from all sources within the vehicle; and (2) what would be the effect upon the air pollution potential of vehicle emissions if fuels were modified to make the evaporative losses less reactive in the atmosphere? The effect of fuel volatility and front-end fuel composition on the amount and photochemical reactivity of automobile exhaust and fuel-system evaporative emissions was investigated using six gasolines; the base fuel, three fuels of varied volatility, and two fuels differing from the base and from each other in front-end olefin content. Data were obtained from 16 vehicles operated on a chassis dynamometer using a speed-load-time cycle that approximated a typical urban trip. Tests were made at ambient temperatures of 20, 85, 70, and 95 F, using a climate-controlled dynamometer room. The amount of hydrocarbon emission and its probable photochemical effect, a potential contribution to pollution, is expressed as weight (reactivity equivalent) of a moderately reactive material, ethylene. Emissions of oxides of nitrogen, carbon monoxide, and aldehydes were also observed. Results showed that reduction of volatility from currently typical levels serves to reduce both the amount and the reactivity equivalent of evaporative losses with a slight penalty by way of higher exhaust emissions. Alternatively, reducing the amount of light (low boiling) olefin in the fuel had no effect on the amount of hydrocarbon pollutant but did significantly reduce the reactivity equivalent of the emissions. Neither volatility change nor chemical changes to the fuel significantly affected the nonhydrocarbon emissions.

7483 APTIC NUMBER 19223

Egan, Richard T. and Lawrence M. Roberts
WET BOTTOM PRECIPITATOR. (Research-Cottrell, Inc., Bridgewater, N. J.) U. S. Pat. 3,509,695. 6p., May 5, 1970. 20 refs. (Appl. July 21, 1965, 4 claims).

A particle removal system for electrostatic precipitators is described. A series of hoppers are filled with water and located directly below the electrodes of the precipitator. The electrodes are vibrated to dislodge particles which collect on them, and the particles fall into the water. The water is maintained in constant motion and is recirculated, with an amount being discharged to waste and an equal amount added to maintain a constant level. This system has advantages over previous ones because periodic removal of particles to prevent buildup is unnecessary, and because the water traps any 'sneakage' due to particles missing their intended flowpath.

7484 APTIC NUMBER 21778

Egi, Kogo
DEVELOPMENTS IN THE DESULFURIZATION TECHNIQUE OF HEAVY OIL. (Juyu datsuryu gijutsu wa dokomade shinpo shitaka). Text in Japanese. Kinzoku (Metals) (Tokyo), 40(13):86-88, July 1, 1970.

In Japan, the consumption of petroleum has increased with the development of industries. Ninety percent of the crude oil imported by the country comes from the Middle East and contains about 3% sulfur. The consumption of heavy oil is about 55% of all petroleum products. These conditions plus the concentration of industries in limited land areas, make the problem of air pollution by sulfur dioxide unavoidable. As a countermeasure, laws were enacted to limit the sulfur content of fuel to 1.0% until 1978 and then to 0.55% until 1983. Means to achieve these goals are to import low sulfur crude oil, desulfurize heavy oil, or desulfurize exhaust gases. Since the latter is possible only for large consumers development of fuel-oil desulfurization processes is recommended as a radical solution to the immediate problems. The only practical method for desulfurization of a petroleum product is hydrogenation desulfurization. The technique of desulfurization of light oil is comparatively easy and has been put to practical use, but that of heavy oil involves difficulties. The methods are classified as direct, indirect, and intermediate. About 75% desulfurization is obtainable by the direct method and 40% by the indirect method. Of the two intermediate methods, the first reduces sulfur content to 1.6% and the second to 0.5%. Problems common to all methods are the expense of hydrogen and the absence of a high-performance catalyst. Utilization of by products must be investigated in order to lower the cost of desulfurization.

7485 APTIC NUMBER 19193

Eguchi, Yoshitomo
ACTIVATED CHARCOAL AIR FILTER AND ITS USES. (Kasseitan ea firuta to sono yoto). Text in Japanese. (Kukichowa Eisei Kogaku (J. Japan Soc. Heating Air Conditioning Sanitary Engrs.), 9(1):48-61, Jan. 1969. 14 refs.

Since a man inhales at least 20 cu m of air per day, his health is influenced by the quality of the air he breathes. Natural air must have suitable temperature, humidity, and wind velocity; it must not contain dust, mist, harmful gases, and microorganisms. Among air pollutants, dust is decreasing due to the change of fuel and the use of dust collectors. In contrast, gaseous air pollutants are increasing. Sulfur dioxide is contained in the exhaust gas of heavy oil and carbon monoxide, hydrocarbons, and nitrogen oxides in auto engine exhaust. Hydrocarbons in particular react with nitrogen oxides to form ozone, which stimulates mucous membranes. Methods of eliminating gaseous pollutants are classified as condensation, absorption, decomposition, masking, and adsorption. The latter method is useful for elimination of a gas composed of many components, with activated charcoal as the most effective adsorbent. Activated charcoal, which acts on sulfur dioxide, nitrogen oxides, and ozone as a catalyst, is relatively unaffected by humidity. It can be used with an air conditioner to reduce the amount of polluted air entering a room. While an atomic submarine can navigate continuously under water only for a week with a complete supply of oxygen and complete elimination of carbon monoxide, air purification by activated carbon makes it possible for the submarine to be submerged for a month.

7486 APTIC NUMBER 19254

Eishold, Horst-Guenter and Walter Steuernagel
GROUND FOR ELECTROSTATIC DUST COLLECTOR ELECTRODE. (Metallgesellschaft A. G., Frankfurt (W. Germany)) U. S. Pat. 3,513,635. 3p., May 26, 1970. 6 refs. (Appl. Oct. 23, 1968, 5 claims).

A ground mechanism for electrostatic dust collector electrodes is described. A pipe-type collecting electrode composed of non-conducting material is grounded by means of an electrically conducting coating on one end of the electrode and an electrically conducting strand looped around the coating. The windings of the strand are separated by spacers composed of non-conducting material. This system has advantages over previous ones because it can be used with corrosive materials, since the electrode is non-metallic, and because the ground mechanism required no special floor design, as most others do.

7487 APTIC NUMBER 19579

Elenkov, D. and N. Boyadjiev
ABSORPTION OF SULFUR DIOXIDE IN WATER AND AQUEOUS SOLUTIONS OF SURFACE-ACTIVE AGENTS. Compt. Rend. Acad. Bulgare Sci., 18(12):1141-1144, 1965. 7 refs.

The absorption of a medium-soluble gas in a nozzleless venturi tube with a slant feeding of the absorbent was investigated, in addition to the effect of mixtures with surface-active behavior on the mass exchange, carried out with 0.67, 1.86, 4.62, and 6.79% sulfur dioxide in pure water and in 0.1, 0.01, and 0.001 aqueous solutions of Nekal BX. Gas velocity in the absorber throat was

40 to 120 m/ sec. The amount of absorbed gas was determined interferrometrically for the gas phase and iodometrically for the liquid phase. Experimental data for absorption in water and in aqueous solutions are graphically illustrated. The data for water is satisfied with a mean error of plus or minus 7% and the data for aqueous solutions with a mean error of plus or minus 10% by an equation derived by the least squares method. Values of the efficiency of the absorber, defined as the ratio of the absorbed amount of gas to the theoretical maximum possible amount that can be absorbed, are tabulated for relative expenditures of liquid in cu m/cu m gas. In addition, equations are presented for determining the maximum equilibrium concentration of SO2 in the absorbent at the outlet of the absorber.

7488

APTIC NUMBER 19550

Ellsworth, R. D. and R. P. Pandahl
THE CONTROL OF EFFLUENTS FROM MUNICIPAL INCINERATORS. J. Air Pollution Control Assoc., 7(1):43-46, May 1957. 9 refs. (Presented at the Air Pollution Control Association, East Central Section Meeting, Columbus, Ohio. Sept. 1957.)

For various reasons, it is apparent that incineration of rubbish is going to be the primary method of disposal in the future. Incinerator technology and emission problems are discussed. Various types of flue gas sampling mechanisms are described. Tabulated results of emissions from municipal incinerators are given. The settling-chamber type of collection system usually incorporated into the design of larger incinerators either needs improvement or additional collection equipment must be added. Fly-ash emissions can be controlled by wet scrubbers, but high cost and water problems can occur. Inertial separators employing baffles may be used to control particulates. Full-scale tests on existing installations are needed to supply necessary information.

7489

APTIC NUMBER 19608

THE ELIMINATION OF SULPHUR FROM FLUE GASES. Engineering (London), vol. 146:499-501, Oct. 28, 1938.

The treatment of stack gases from two powerplants in England is discussed. At the Battersea station, the gas is washed by water from the Thames, the sulfurous acid being oxidized to sulfuric acid, and this acid is neutralized by the natural alkalinity of the Thames water. The Fulham power station employs a packed tower type gas washer, with calcium-sulfate crystals added to the lime water to inhibit deposition. If the recovered products can be sold, they will more than pay for the cost of the process. The problems and difficulties encountered in setting up the Fulham station are discussed.

7490

APTIC NUMBER 19220

Frman, James E.
DESULFURIZATION USING HYDROGEN CHLORIDE AND HYDROGEN. (Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,509,045. 4p., April 28, 1970. 5 refs. (Appl. July 11, 1968, 6 claims).

An improved method of desulfurizing hydrocarbon oils in the presence of hydrogen at a temperature between 600-950 F and partial pressure between 100-5000 psig and in the presence of hydrogen chloride at a partial pressure above 150 psig is described. Inert particles providing contact surface area for the reactants may be used but are not required. This process converts organic sulfur compounds contained in a heavy oil such as crude residuum to sulfur-free organic compounds and hydrogen sulfide. This process has advantages over catalytic hydrodesulfurization because this process does not require the presence of small catalyst compounds. Also, it is not necessary that the heavy oil be treated in the liquid state.

7491

APTIC NUMBER 19908

Frsolaev, M. T., F. A. Krasovitskaya, Yu. V. Krasovitskii, A. A. Mukhin, and P. S. Pil'shenko
A METALLOCERAMIC FILTER FOR FREEING THE AIR FROM DUST. Refractories (USSR) (English translation from Russian of: Ogneupory, no. 10:618-617, Oct. 1969. 8 refs.

Experiments were undertaken to determine the efficiency of metalloceramic filters for removing dust from a pneumatic transport system for conveying alumina from silos to bunkers in front of tubular grinders. In the experimental arrangement, the gas-dust stream from the gas line connecting the alumina bunker with a filter fabric was passed to a cyclone serving as the first stage of dust extraction. The dust collected in the cyclone was removed through a cyclone bunker and the gas stream containing the finely dispersed fraction of alumina was passed to the metalloceramic filter for fine cleaning. Measurements were made of the amount of gas at the entrance and exit of the cyclone, the metalloceramic filter, and of the dust content at the entrance and exit of the apparatus. As determined by mathematical evaluation of the measurements, the efficiency of the purification plant is close to unity. The cyclone not only relieves the filter from the main amount of dust but also increases the efficiency of the filter by increasing particle size. It is noted that a metalloceramic filter must be built in the form of a multiple-section apparatus whose sections work in parallel to one another. A filter designed for a 10,000 cu m/h gas-dust stream and fitted with 3.5-m high sectional filter elements should measure approximately 0.9 by 2.4 by 4.5 m.

7492

APTIC NUMBER 19116

Evans, Basil M.
UNDERGROUND STORAGE UNITS. Gas J., vol. 15-16:339-340, 343-345, Dec. 11, 1963.

Various underground methods of storing gaseous or liquid products of the gas industry for peak-shaving purposes are briefly discussed; these methods are aquifers, salt cavities, existing and newly constructed mined caverns, pressure tunnels, covered surface quarries or pits, underground reinforced or prestressed concrete tanks, and large diameter boreholes. Such

aspects as cost, geological and soil factors, engineering design site selection and construction techniques are considered. Working experiences with these problems at facilities constructed in Britain and elsewhere are included in the record of the subsequent discussion period.

7493 APTIC NUMBER 19155

Every, Richard L. and Ralph Leroy Grimsley
METHOD OF PREPARING DISPERSIBLE SULFUR. (Continental Oil Co., Ponca City, Okla.) U. S. Pat. 3,318,666. 2p., May 9, 1967. 3 refs. (Appl. Feb. 1, 1965, 5 claims).

A process is described for producing sulfur from gases containing sulfur compounds; for preparing sulfur dispersions in a carrier liquid; and for preparing sulfur emulsions of high sulfur content. The process involves reacting a gas containing sulfur dioxide and hydrogen sulfide or mercaptans with water containing a small amount of an aliphatic alcohol. Suitable gases for use in this process include sour gases from gas wells and refining operations, sulfur containing gases from sintering operations, and the like. Alcohols suitable for use include ethanol, methanol, propanol, or any water soluble aliphatic alcohol of 1 to about 5 carbon atoms. The permissible concentration of alcohol in water is from 0.5 to 5% with 1 to 3% optimum. The sulfur formed is generally less than 5 micron diameter. The gas is bubbled through the water-alcohol solution and reacts to form a suspension of sulfur in the solution. If allowed to stand until the suspended sulfur settles and the clear liquid is decanted off, a 50% solids in liquid mixture is obtained. The resulting mixture can be further concentrated by centrifuging prior to drying or dried by evaporation. The resulting sulfur readily breaks down into finely divided powder by light abrasion. The powder can again by readily suspended in water. By the use of emulsifying agents, a stable emulsion can be formed.

7494 APTIC NUMBER 19101

Fagley, W. S., Mary V. Sink, and C. H. Meinen
MAINTENANCE AND THE AUTOMOBILE EXHAUST - SECOND REPORT. Preprint, Society of Automotive Engineers, Inc., New York, 19p., 1962. 7 refs. (Presented during National Automobile Week Congress, Detroit, Mich., March 12-16, 1962, Paper 486l.)

The effect of regular maintenance of engine components on exhaust emission levels was studied by observing for a 10-month period, 24 privately-owned line-built vehicles dating from 1946 to 1959. Original odometer readings were from 6000-88,000 miles. With properly adjusted electrical and carburetion systems, these vehicles averaged 360 ppm hydrocarbons and 1.7% carbon monoxide, somewhat above the Calif. state standards of 275 ppm HC and 1.5% CO. An adjustment package which is capable of reducing emissions to levels below these standards was then developed, which includes retarding the spark at idle, cruising adjustments, changes in carburetor settings, and a specially designed distributor vacuum advance valve. Using production facilities, 100 adaptation kits for the 318-cu in. engine were prepared and will be studied under operating conditions to gain further data on the feasibility of this approach to emission reduction.

7495 APTIC NUMBER 19260

Fattinger, Volker, Walter Jaeger, and Gerd Peterson
METHOD OF REMOVING SULFUR DIOXIDE FROM GASES. (Hugo Peterson, Wiesbaden, West Germany) U. S. Pat. 3,510,253. 8p., May 5, 1970. 3 refs. (Appl. Dec. 6, 1965, 21 claims).

A process for removing sulfur dioxide from waste gases is described. It's removal by absorption in ammonium sulfite and bisulfite liquors has previously been suggested. However, these processes have several disadvantages, including the insufficient absorption of SO2, the formation of strong mists, and the investment needed for absorption equipment. In the present process, gaseous ammonia is added to the gas flow, a liquid containing ammonium sulfate, sulfite, or bisulfite is injected, and 0.5 to 10 g steam/N cu m are added to form an ammonium sulfite mist. The gas flow is then conveyed to a mechanical separating zone where the gas and injected liquid are contacted with each other to separate the mist and liquid from the gas flow. The ammonia and the liquid enriched gas flow are preferably divided into a number of part flows less than 5 mm in thickness in the mechanical separator. The separated mist and liquid are conveyed to a crystallizing zone maintained at a temperature which is 2-10 C cooler than that in the separating zone. The ammonium sulfate crystals and a mother liquor remain; the liquor is recycled for spraying into the gas flow. The process is suitable for purifying SO2-containing waste gases and effectively facilitates air pollution control.

7496 APTIC NUMBER 19493

Faucett, H. L.
AIR POLLUTION POTENTIAL OF PHTHALIC ANHYDRIDE MANUFACTURE. J. Air Pollution Control Assoc., 20(7):461-465, July 1970. 13 refs.

Production of phthalic anhydride will approach 1,200,000 pounds in 1970. The process off-gas from this production consists of large volumes of air contaminated with small quantities of organic vapor and particulates and carbon monoxide. Some of the major organic contaminants in the process exhaust gas include phthalic anhydride, maleic anhydride, naphthoquione, benzoic acid, and aldehydes. A 100 million pound per year dry recovery plant will discharge from 300 to 1200 lb/hr of organics. Experience has shown that when a plant has an air pollution problem, it is one associated with nuisance odors and lachrymatory emissions. However, in certain West Coast locations, where extended periods of poor air shed ventilation exists, the problem has also been one of contribution of organics to the build-up of excessive air contaminants. Normal stack heights alone frequently have not been sufficient to prevent complaints when atmospheric conditions were not conducive to good dispersion. Plants with stacks rising to 170 ft have found that gas dispersion alone, without abatement equipment, would not consistently prevent unsatisfactory conditions from developing in the neighborhood. Today, those plants providing abatement equipment are split roughly equally between some form of water scrubbing and incineration, the latter

either catalytic or direct flame. It has been suggested that by recycling a portion of the off-gases back to process, a substantial reduction in size and investment for control equipment would be realized. This scheme would only have possibilities for fixed-bed plants inasmuch as the fluid-bed units operate at or near the lower concentrations of oxygen permissable in the off-gas to effect design efficiencies for conversion to phthalic anhydride. It might be possible to reduce the off-gases from a fixed-bed plant by as much as 50%, but pilot work would be required to evaluate the effect of the contaminants in the recycle gas on catalyst life and product yields.

7497 APTIC NUMBER 19201

Welch, Elroy L.
BAG FILTER CLEANING. (Continental Oil Co., Ponca City, Okla.) U. S. Pat. 3,511,639. 3p., May 26, 1970. 10 refs. (Appl. March 30, 1967, 2 claims).

A method for cleaning an elongated flexible bag filter is described. The method does not necessitate removing the bag from service, nor does it subject the bag to harsh treatment. Cleansing is accomplished by subjecting the bag to periodic flexing motions along its length. The flexure is affected either by moving a restricting ring along the length of the bag, or by incorporating a twist in the bag during installation. Motive force can be supplied by mechanical means or by the fluid being filtered.

7498 APTIC NUMBER 20004

Pfooks, R. C. and H. E. Montagu
LNG OCEAN TRANSPORTATION: EXPERIENCE AND PROSPECTS. Cryogenics, vol. 7:324-330, Dec. 1967. 2 refs.

Development on the LNG (liquefied natural gas) tankers Methane Princess and Methane Progress, based on the prototype ship Methane Pioneer, is outlined. Both ships have a capacity of 173,000 bbl and make deliveries from Arzew, Algeria, to the Canvey Island terminal in 10 days (round trip), with a total average port time of 2 3/4 days. These ships incorporate a dual-fuel combustion system which not only utilizes the gaseous boil-off of the cargo, but also reduces fouling of boiler tubes. Projected 364,000 bbl capacity ships are also described with special attention given to storage tank design. Future trends in marine transport of LNG are considered.

7499 APTIC NUMBER 21964

Filatov, Yu. V. and I. P. Mukhlenov
OXIDATION OF CONCENTRATED SULFUR DIOXIDE IN A FLUIDIZED CATALYST BED. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 41(3):463-467, March 1968. 5 refs.

The activity and stability of an abrasion-resistant vanadium catalyst were determined, and an attempt was made to assess the effects of mixing and breakthrough of sulfur dioxide on the reaction rate. The activity of the catalyst in oxidation of highly concentrated SO2 was fairly close to that of NAV catalyst. An equation is given which represents SO2 oxidation in fluidized catalyst bed in a laboratory with sufficient accuracy. The reaction rate constants obey the Arrhenius law up to 560 C; at temperatures above 560 C, the values of the constant are lower than those calculated from the Arrhenius equation. The decrease of activity is apparently due to a reversible chemical conversion of the active catalyst complex to a less active form. The results of these studies make it possible to establish the optimal conditions of temperature and composition of the mixture for the most intensive oxidation of SO2 in a fluidized bed of vanadium catalyst. (Author conclusions modified)

7500 APTIC NUMBER 19315

DUST CONTROL AND AIR CLEANING EQUIPMENT. Filtration Separation (Purley), 6(6):737-739, Nov./Dec. 1969.

Several types of dust control and air cleaning devices are discussed. A dust collection system has been developed for controlling the process dust from the manufacture of mineral fibre ceiling tiles. The system operates in two phases. Phase one is a plant with a capacity of 20,000 cu ft of dust-laden air/minute, which serves either of two sanding machines. The dust is drawn into two conical silos, each of which has five collectors at the top. The filters are automatically cleaned by a jet of compressed air blown through them countercurrently to the air flow. Phase two includes a large collector with a pre-separator and single hopper. It handles 28,000 cu ft of air/minute, and serves a saw which trims the mineral fibre boards. A new cabinet-type collector is self-contained, with a built-in metal filter and dust drawer. By a 180 degree direction change, the air is forced through a coarse screen filter before flowing through the metal filter and a cloth after-filter. Another dust collector, operating like a cyclone separator, removes dust, grit, and other particulates at their source. New bag filters have been developed for filtering dust, fumes, and gases. The filter sleeves are continuously cleaned by blasts of air. As a result, only 3-4% of the filter area is off-stream for cleaning at any one time. The particles are constantly discharged by a mechanism which obviates the need for a hopper and precludes the problem of dust bridging across it.

7501 APTIC NUMBER 19375

Fleming, Edward P. and T. Cleon Pitt
PRODUCTION OF SULPHUR FROM GASEOUS MIXTURES. (American Smelting and Refining Co., New York) U. S. Pat. 2,431,236. 7p., Nov. 18, 1947. 9 refs. (Appl. Aug. 4, 1943, 8 claims).

A method for producing elemental sulfur from sulfur dioxide is described. The SO2-containing gases are treated in a three stage catalytic converter system. Clean raw gas containing SO2 reacts with a hydrocarbon fuel, such as natural gas, in a reduction furnace at a temperature above 1200 C for the rapid reduction of SO2. The gas stream is cooled to 425-450 C and passed through

the first stage of the conversion system. It is passed into a first catalytic chamber containing bauxite where additional sulfur compounds are converted to elemental sulfur. The gas is cooled to 120-140 C and passed through an electrostatic precipitator where a large amount of sulfur is removed. To convert the sulfur compounds in the residual gases, particularly hydrogen sulfide, the gases are heated to 200-250 C and passed through a second catalytic chamber and electrostatic precipitator. The gases from this part of the system may contain small but important amounts of SO2 and H2S. The gas stream is passed through a third catalyst chamber, cooled, and sent to an electrostatic precipitator. The residual gas stream is then vented to the atmosphere.

7502 APTIC NUMBER 19423

Fleming, Edward P. and T. Cleon Fitt
RECOVERY OF SULPHUR FROM GASEOUS MIXTURES. (American Smelting and Refining Co., New York) U. S. Pat. 2,388,259. 5p., Nov. 6, 1945. (Appl. July 17, 1942, 7 claims).

A method is described for recovering sulfur by the reduction of sulfur dioxide contained in gases from roasting, smelting, and other similar metallurgical operations, with the use of a hydrocarbon fuel such as natural gas. A sufficiently high efficiency can be achieved with this method to produce brimstone on a commercial basis. The SO2-bearing gases are reacted with the reducing gas at a temperature above 1200 C to yield a hot gas stream, which is then cooled to about 400-450 C by heat exchange with incoming SO2-bearing gases and with stripped gas from a first electrical precipitation step. The cooled stream is contacted with a first mass of catalyst, cooled to under 150 C, and then subjected to a first electrical precipitation step, thus recovering sulfur and yielding a stripped gas stream, used as above for heat exchange. The heated stripped stream is contacted with a second catalyst, again cooled, and electrically precipitated a second time to recover additional sulfur and yield a discard gas stream. Bauxite is the catalyst used in the process example given.

7503 APTIC NUMBER 21719

ADDITIVES FOR FUELS. In: Petroleum Products, Properties, Quality, Application. (Nefteprodukty, Svoystva, Kachestvo, Primeneniya.) B. V. Losikov (ed.), 1966, Chapt. 5. 98 refs. Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., p. 304-394, Aug. 22, 1969.
CFSTI, DDC: AD 698546

Five principle categories and 16 sub-categories of motor fuel additives are identified. Physical and chemical properties of specific additives in each sub-category are discussed, both singularly and in combination. Two categories in most widespread use are additives that improve fuel motor properties and additives that improve stability of fuels during storage, shipment, and use in engines. Other categories identified include additives that reduce detrimental effects of fuels on apparatus and mechanisms, additives that facilitate the use of fuels at low temperatures, and a category identified as other additives which includes such sub-categories as dyes, additives that prevent the accumulation of static electricity, and additives that prevent microorganism spoilage of fuels. It is of particular interest to note the superiority of manganese based anti-knock compounds over lead based anti-knock compounds.

7504 APTIC NUMBER 19398

Francis W. and G. H. Lepper
RECOVERY OF SULPHUR FROM FLUE GASES. Engineering (London), vol. 172:36-37, July 13, 1951.

Four processes for recovering saleable sulfur products from flue gases are described. The production of ammonium sulfate by double decomposition is commercially feasible when boiler house and gas washer are reasonably close together. An alkali-additive process recovers solid sulfur, liquid sulfur dioxide, or sulfuric acid and cement. The recovery of ammonium sulfate and sulfur is a direct process in which solutions of ammonium carbonate are used as the scrubbing agent. Another process uses sodium carbonate as the scrubbing medium, producing sodium sulfite and sulfate. Preliminary cost estimates of recovering sulfuric acid from a large power station burning 2000 tons of coal per day with an average sulfur content of 1.5% would be approximately $20.

7505 APTIC NUMBER 21887

Franzky, U.
THE USE OF OXIDATION PROCESSES FOR REDUCTION OF ODOROUS EMISSIONS. (Ueber den Einsatz von Oxidationsverfahren zur Verminderung geruchsintensiver Emissionen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:291-302, 1970. 29 refs.

Thermal waste gas treatment is by far the most efficient method, but also the one with the highest operating costs, for the reduction of odorous emissions from animal rendering, coffee roasting, pyrolysis of beech wood, and foundries. The waste gas is pressed into a combustion chamber where guide vanes impart a rotary movement to the gas. The oil or gas burner is tangentially attached to the cylindrical chamber wall. Waste gases from a coffee roasting plant could be cleaned from 575 mg C/cu Nm to 170 mg C/cu Nm when temperatures in the chamber did not exceed 485 C. Better results are obtained at temperatures between 680 and 800 C, while concentrations of more than 10 g/cu Nm in the uncleaned gas could be reduced to less than 100 mg C/cu Nm at 740 C. Catalytic oxidation has found wide-spread use in the past few years, in which it generally suffices to heat the waste gases to just 350 or 400 C. Thus, costs for energy can be saved. Catalysts with palladium or platinum as active ingredients are used. Efficiencies of 90 to 95% are achieved with this method, but a higher maintenance service is required. Deodorization of the air in a poultry farm and pig sty by addition of ozone was unsuccessful. Better results were obtained in a mink farm by soaking a bed of sand with potassium permanganate solution 100g/12 liter water, 1 liter solution per 1

sq m sand). Mink feces falling onto this soaked bed were deodorized to a large extent. No final results are available as experiments with this method are still in progress.

7506 APTIC NUMBER 19252

Frevel, Ludo K. and Leonard J. Kressley
SEPARATION OF FLY ASH AND SULFUR DIOXIDE FROM FLUE GASES. (Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,505,008. 8p., April 7, 1970. 1 ref. (Appl. Oct. 30, 1967, 15 claims).

A method to separate fly ash and gaseous pollutants, especially sulfur dioxide, from stack gases is presented. The method involves passing the gas through a thin, porous bed of alkali-metal bicarbonate crystal particles, at a temperature between 0-125 C. The crystal particles should have a size range of 40-100 mesh. The SO2 removal is affected by an efficient gas-solid reaction between the crystals and the gas. The crystals attract and hold fly ash particles to submicron size. The method is economical to operate and is potentially capable of producing returns in the form of saleable products. The system has advantages over previous ones because both particles and gas are removed in a single step, and because submicron-size particles are efficiently separated.

7507 APTIC NUMBER 19459

Frysinger, Glen R.
BATTERY-FUEL CELL SYSTEM. Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 54-59. (May 16-18.)

The development of a hybrid automotive propulsion system based on a hydrocarbon-air fuel cell and a molten salt lithium chloride secondary battery is proposed. Integration of the capabilities of these two elements could allow a vehicle to have full range capability, excellent acceleration characteristics, and use conventional hydrocarbon fuels. To achieve this performance requires the successful development of a 150 watt hour per pound molten electrolyte battery and a 20-35 pound per kilowatt hydrocarbon-air fuel cell. It was estimated that these goals would be achieved in operational hardware within 5-10 years.

7508 APTIC NUMBER 19816

Fujita, Masahiko, Kiyoshi Iwashima, Masao Mishima, and Takeo Suzuki
THE FORMATION OF MANGANESE ION IN THE REACTION OF DESULFURIZING AGENTS AND WASTE GAS. (Haigasu datsuryuzaichu no mangan no kyodo). Text in Japanese. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 18(3):144-147, Sept. 1969. 4 refs.

One of the methods of removing sulfur oxides from waste gas is the use of manganese dioxide which is considered to be very effective. However, although the toxicity of manganese dioxide itself is low, the reduction of manganese dioxide during the treatment of waste gas results in the formation of Mn(II) which is quite harmful. By means of paper electrophoresis, atomic absorption spectrophotometry and emission spectrophotometry, the extent of the production of Mn(II) during desulfurization was studied. More than 77% of manganese dioxide is reduced to Mn(II) which is soluble in water.

7509 APTIC NUMBER 19370

Ganz, S. N., I. E. Kuznetsov, V. A. Shlifer, and L. I. Leikin
REMOVAL OF NITROGEN OXIDES, SULFUR DIOXIDE, MIST, AND SULFURIC ACID SPRAY FROM EXHAUST GAS BY PEAT-ALKALI SORBENTS UNDER PRODUCTION CONDITIONS. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 41(4):760-764, April 1968. 1 ref.

Optimal conditions were determined for the absorption of nitrogen oxides, sulfur dioxide, mist, and sulfuric acid spray from sulfuric acid tower systems by means of peat-alkali absorbents. Shredded peat with a moisture content up to 50% was used for absorption; solid ash, apatite concentrate, aqueous ammonia, and ammonia gas were used as additives to the peat. The moisture content of the peat in the absorber must not be below 25-30%, as at lower moisture contents the peat begins to form dust and the absorption process deteriorates considerably. Ammonia introduced directly to the fluidized beds was the most effective additive, removing 90% of the acidic components of the waste gas in 90 min. For 80% purification of the gas in one hr, it is sufficient to have one or two beds with a total sorbent height of about 500 mm. A sulfuric acid plant with a gas output of up to 60,000 cu m/hr will require 0.294 tons ammonia, 1.5 tons of dry peat, and 3 tons of peat (with a moisture content of 50%) per hr for gas decontamination. Sorption of the gases by the peat-ammonia sorbent yields an effective organomineral fertilizer.

7510 APTIC NUMBER 19331

Gardner, Conrad O.
AIR POLLUTION PREVENTION SYSTEM AND APPARATUS. (Assignee not given.) U. S. Pat. 3,503,188. 4p., March 31, 1970. 18 refs. (Appl. April 25, 1966, 3 claims).

A system is proposed for collecting and processing exhaust emissions from motor vehicles travelling along a highway. Automobiles are provided with both magnetic sensors for locating metal inlet gratings embedded in the highway and a moveable extension of the exhaust pipe; the extension controlled is nearly flush with the gratings. The gratings are positioned on top of a main duct running parallel to and under the highway. Suction fans are located in side ducts in such a manner as to draw exhaust emissions through the inlet gratings and main duct to processing units where gases will be purified and the purified air returned to the atmosphere. The processing units can be designed to remove a particular contaminant. One unit, for instance, could be equipped with a catalytic muffler for the oxidation of hydrocarbons and another supplied with ammoniacal solutions for the absorption of carbon monoxide. Either unit could additionally

be provided with an electrostatic precipitator for the recovery of particulate lead. The bulk equipment that can be used by the processing units has the advantage of higher efficiencies than the compact pollution-control devices installed in cars.

7511 APTIC NUMBER 21957

IN-GROUND STORAGE AT CANVEY ISLAND METHANE TERMINAL. Gas World Gas Coke, 167(4372):683-685, June 1, 1968.

The Canvey Island methane terminal consists of four frozen-ground storage units. The facility can hold enough gas to supply the whole of Britain for five days. The method of constructing the in-ground tanks involves prefreezing an earthen cylinder and base, removing the earth from inside, and covering the hole with an aluminum roof, set into a reinforced concrete ring beam with stainless steel roof anchorage rings. The finished size of the storage pit is 130 ft deep by 130 ft in diameter. Electrically operated flow pumps discharge the gas as needed.

7512 APTIC NUMBER 19925

Gasiorowski, K.
PROBLEMS INVOLVED IN THE DESULFURIZATION OF RESIDUAL FUEL OILS. (Die Problematik der Entschwefelung schwerfluessiger Heizoele). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:397-405, 1970. 3 refs.

The demand for low-sulfur residual fuel oils has already exhausted or exceeded the possibilities for their preparation from low-sulfur crude oil, which at present is obtained almost exclusively from North Africa, increasing the tendency to employ the desulfurization of high-sulfur fuel oils. A basic problem has to do with the economics of desulfurization. Differences in the state of market from country to country complicate any attempt to provide a uniform set of criteria. In West Germany and many other countries, the fuel oil presently marketed has a maximum sulfur content of 1%, whereas the average heavy fuel oil available on the worlds market has a sulfur content of 2.5-3.5%, and sometimes higher. Desulfurization by direct hydration (especially if applied to the original crude oil) eliminates the need for desulfurizing the lighter fraction of the petroleum, but may cause contamination of the catalyst. The process also tends to yield a larger percentage of the lighter products. Vacuum distillation avoids catalyst contamination and provides a larger residue of heavier products, but only about 1/3 of the sulfur can be removed from the oil. A process can also be used that binds the contaminating elements to asphalt, which is then used in road building and roofing. In such cases the crude oil must be compatible with the asphalt. Atmospheric distillation gives an average gasoline yield of 15-20% and 30-40% fuel oil. The American market calls for a higher yield of gasoline and the lighter products, while the German market places more emphasis on heavy oils. Japan was to have completed 11 desulfurization plants by the end of 1969 each with a capacity of 600-6000 tons per day. At least 6 more plants are to be built in 1970, bringing the total capacity to 20 million tons per year. In the eastern USA, 11 plants are built or being built, capable of producing a total of 40 million tons of fuel oil, with a specific cost of $10.00-22.50 per ton of fuel oil processed.

7513 APTIC NUMBER 19345

Gendre, R.
RECOVERY, EXPULSION AND DILUTION OF FUMES FROM AN ELECTRIC ARC FURNACE. (Captation, expulsion et dilution des fumees de fours a arc). Courrier Establis. Neu, no. 44:15-20, July 1968.

An apparatus for the removal of fumes from the room in which an electric arc furnace is located consists of a hood in the ceiling directly above the furnace, above which is located a series of blowers, which draw the fumes upward into a stack, which is covered at its upper extremity with a Linderoth cap. This system provides complete recovery and expulsion, does not interfere with the use of the furnace, makes use of simple, conventional types of installation, requires a modest amount of material, very little maintenance, adaptability (only part of the fans need be used during phases other than oxidation), and low operating expense. Several installations of this type have been used in recent years and have given complete satisfaction.

7514 APTIC NUMBER 11949

Ginodman, G. M.
THE PURIFICATION OF GAS EMISSIONS IN THE SULFATE PULP MILLS. (Oschistka gazovykh vybrosov v sulfattselliulcznca proizvodstve). Bumazhn. Prom. (Moscow), 22(7):16-22, 1947. 10 refs. Translated from Russian. 21p.

Methods are reported for cleaning the exhaust gases from pulp cooking in sulfate pulp mills; until recently, the extraordinary explosiveness and flammability of these gases has delayed progress in developing control processes. A detailed analysis of emitted gases was carried out. Vapors of turpentine and various methyl compounds are among the gases produced from the pulp cooking process and drawn off; the majority of the sulfur compounds are emitted into the atmosphere. Stack gases also have high dust content, consisting principally of sodium sulfate and carbonate salts, with most particles sized less than 60 micron. In the cooking plant, the greatest fire and explosion hazards are caused by turpentine blow-offs and increasing condensation of turpentine vapors. An explosion pipe was used to study the explosiveness of turpentine vapors and for gases liberated from mercaptan and hydrogen sulfide. Experiments showed that simple, save, and inexpensive combustion of disagreeably odorous gases can be performed in recovery furnaces under three conditions: stringent thermal control of the blowoff under cooling of the exhaust gases to a maximum of 30 C; subsequent dilution of the gases with air to at least fifty times their volume at the time of the final blow-off; and application of effective automated devices to prevent access to the furnaces of gas-air mixtures exceeding 30 C. The sulfur products of gas combustion are bound in the furnace with alkali. These conditions also ensure the maximum yield of commercial turpentine. A second method of gas cleaning judged effective in removing odorous sulfur organic compounds and H2S is treating the gases with alkaline solutions containing active

chlorine. Suspension of milk of lime (80 g/l CaO) was used as the absorbing solution and calcium hypochlorite as chlorinating reagent, producing oxidation of sulfur and formation of higher acid anhydrides.

7515 APTIC NUMBER 19496

Gioia, Francesco and Giuseppe Marrucci
ABSORPTION OF H2S AND CO2 IN AQUEOUS PHOSPHATE SOLUTIONS. Chem. Eng. J. (London), 1(2):91-96, April 1970. 7 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 64th, New Orleans, La., March 1969.)

Absorption rates of carbon dioxide and hydrogen sulfide into aqueous solutions of potassium phosphate and potassium hypophosphate have been measured using a wetted cell absorber. The absorption rate of either CO2 alone or H2S alone can be predicted theoretically and has been confirmed experimentally. In the case of simultaneous absorption of both gases, one can qualitatively predict that the H2S absorption is not influenced by the presence of CO2, while the CO2 absorption is effectively reduced by the action of H2S. This prediction also is confirmed by experiments. Very high selectivity for H2S is obtained with this system. The interest in the use of buffer phosphate solutions is also due to the fact that phosphorus pentoxide is nonvolatile. (Author abstract)

7516 APTIC NUMBER 19590

Gluud, Wilhelm and Walter Klempt
TREATMENT AND PURIFICATION OF CERTAIN GASES. (Gesellschaft fuer Kohlentechnik m.b.H., Dortmund-Eving (West Germany)) U. S. Pat. 1,950,981. 2p., March 13, 1934. (Appl. July 16, 1930, 3 claims).

A method for removing carbon monoxide and organic sulfur compounds from heating gas is described. The gas is contacted with calcined dolomite at an elevated temperature causing the dolomite to catalytically oxidize CO with water vapor to carbon dioxide. High temperature elicits a rise in the CO2 vapor pressure, and any CO2 in excess of this pressure is absorbed by the dolomite and held in the solid state. The organic sulfur compounds are converted to hydrogen sulfide which is also absorbed by the calcined dolomite. In the subsequent regeneration process, the H2S is removed and converted to calcium sulfate.

7517 APTIC NUMBER 21938

Goldfield, Joseph, Vincent Greco, and Kunud Gandhi
GLASS FIBER MATS TO REDUCE EFFLUENTS FROM INDUSTRIAL PROCESSES. J. Air Pollution Control Assoc., 20(7):466-469, July 1970.

Many effluents from process operations produce submicron, organic, sticky particulates that are difficult to filter. They may be associated with odors. Until now, incineration or high energy scrubbers operating at as high as 60-70 in. of water were among the possible air cleaners that could solve these problems. The operating costs and the possible water pollution problems make it desirable to find alternative solutions. Effluents from glass fiber ovens and forming chambers and from roofing plant saturators are filtered. Samples are drawn from the stacks of these machines through samples of glass fiber mats of various fiber diameters and through relatively coarse fiber mats impregnated with asbestos fibers. Efficiencies are measured by a Sinclair-Phoenix photometer, gravimetrically, and by odor tests. In the ranges tested, efficiency appeared to increase with increasing velocity through the mats. At velocities of 500-700 ft/min through the glass fiber mats, efficiencies of well over 90% are not uncommon. Pressure drops are 16-18 in. water. Odor tests show that odor reduction correlates with particulate removal, indicating that most of the odor is due to particulates. The useful life of the filter depends on the degree of plugging. For the effluents tested, two to three hours is practical and economically feasible. A full-scale installation of 10,000-11,000 cfm capacity has been made and is operating successfully. (Author abstract)

7518 APTIC NUMBER 19339

Goldschmidt, K.
FLUE GAS DESULFURIZATION EXPERIMENTS. (Versuche zur Entschwefelung von Rauchgasen.) Text in German. Chem. Ing.-Techn., 40(21-22):1082-1086, 1968. 4 refs. (Presented to the Inst. Chem. Engrs. and the Assoc. Process Engrs., Joint Meet., Brighton, England, 1968).

In a power plant in Ludwigshafen, three desulfurization experiments were conducted: calcium oxide was added to pulverized coal, Ca(OH)2 and Ca(OH)2.Mg(OH)2 were separately injected into a pulverized coal-fired boiler, and lime and dolomite were separately injected into an oil-fired boiler. Addition of calcium oxide to coal caused sintering and excessive soiling of the boiler. The best desulfurization was achieved by injecting Ca(OH)2 into the oil-fired boiler. Sulfur dioxide content in the flue gases sank gradually during the test period, as a CaO layer was deposited which continued to bind SO2 although no new CaO was injected. In the pulverized coal-fired boiler, the SO2 content was rapidly reduced by the desulfurizer but remained constant for the rest of the experiment. When no more additive was injected, the SO2 content rapidly returned to the original level. Dolomite was less effective than Ca(OH)2. The latter additive has more free CaO for reaction with SO2.

7519 APTIC NUMBER 19567

Greeley, S. A. and Abraham Michaels
DESIGN CRITERIA FOR MUNICIPAL INCINERATORS. J. Air Pollution Control Assoc., 6(3):133-143, Nov. 1956. 8 refs. (Presented at the American Society of Mechanical Engineers Semiannual Meeting, Cleveland, Ohio, June 17-19, 1956.)

Two papers representing the points of view of the designer and the customer respectively include only those parts of direct interest to air pollution and its control. A description of the

designer's problem is presented in terms of types of pollutants, degree of control desirable, and types of control equipment which were being tried. Cyclones, gravel filters, water, and electric precipitation were all too expensive to be risked in their present untried state; the designer should stick to the proven subsidence chamber but allow sufficient room at strategic points to permit incorporation of whichever system proves most economical in the future. From the customer's point of view, pollution control--as long as it did not increase the cost too much--was an excellent selling point to the electorate. More concern was expressed over the cost of technically competent personnel to operate automated facilities as compared to the cost of the unskilled labor required to operate conventional manual installations. Both the designer and the customer emphasized the need for equipment reliability to reduce expensive down-time and maintenance.

7520 APTIC NUMBER 21842

Gregory, Constantine Joseph
ABSORPTION OF ATMOSPHERIC SULFUR DIOXIDE BY NATURAL AND SYNTHETIC TEXTILE FIBERS. Rutgers Univ., New Brunswick, N. J., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms Inc., May 1968, 173p. 95 refs.

A laboratory study was performed to determine the rate and extent of removal of atmospheric sulfur dioxide by undyed fibers of wool, viscose rayon, nylon, and cotton. The mechanisms involved in the uptake of the gas were also investigated. Fiber samples were exposed to sulfur dioxide concentrations ranging from 0.78 to 5.25 micrograms/liter (0.3 to 2.0 ppm by volume). Exposure times varied from 60 minutes to 20 days. Textile fibers removed atmospheric sulfur dioxide at rates directly proportional to their moisture contents, when these moisture values were less than the saturation values. After 60 minutes exposure to 1.05 micrograms SO2/liter (0.4 ppm by volume), the sorption rate for wool with 5.8% moisture was 0.115 micrograms SO2 per gram wool per minute. Similar fibers with 15.8% moisture had a sorption rate of 0.230 micrograms SO2 per gram wool per minute. The sulfur dioxide removal capacity of textile fibers, based on the rate and extent of gas sorption, was largest for wool and smallest for viscose rayon. The rates of sulfur dioxide removal for viscose rayon and cotton were initially similar to the rates obtained for wool. The total sulfur dioxide removal by these fibers was considerably less than obtained with wool. Rate curves for sulfur dioxide sorption by wool at a given moisture content less than saturation were characterized by a steadily decreasing rate of sulfur dioxide uptake. Comparisons were made between sulfur dioxide sorption rates for water and suspensions of fibers in water. The rate curve for absorption of sulfur dioxide bubbled through water could be described by a parabolic function of the form: y equals ax squared plus b. The rates of sulfur dioxide sorption for viscose rayon - water and nylon - water systems did not show a significant difference from the rate observed for water alone. Suspensions of wool or cotton in water resulted in increased rate and extent of sulfur dioxide sorption, an indication that the mechanism of sulfur dioxide removal by these fibers involves a reaction between the fibers and the gas. The chemical affinity of sulfurous acid for wool at 0 C. was minus 10.3 kg cal. This value was used to calculate a titration curve for the reaction of wool with sulfurous acid. The calculated curve was in good agreement with experimental data. Sulfur dioxide sorption did not occur when the moisture associated with the fibers reached a pH value below 3.6. (Author abstract)

7521 APTIC NUMBER 21932

Gregory, Constantine J. and Raymond M. Manganelli
MECHANISM OF SULFUR DIOXIDE ABSORPTION BY NATURAL AND SYNTHETIC TEXTILE FIBERS. J. Air Pollution Control Assoc., 20(7):471, July 1970. 1 ref.

Sulfur dioxide uptake by textile fibers with respect to mechanisms involving solution of the gas in moisture held by the fibers and chemical reaction at specific sites on the fiber was investigated. The absorption of SO2 is determined at several levels of fiber equilibrium moisture content. Nylon samples exhibited the least capacity for SO2 absorption. Cotton approached saturation before wool. Absorption is accompanied by a steady increase in pH.

7522 APTIC NUMBER 19817

Grekel, Howard
RECOVERY OF SULFUR FROM GASES CONTAINING HEAVY HYDROCARBONS. (Pan American Petroleum Corp., Tulsa, Okla.) U. S. Pat. 3,317,281. 2p., May 2, 1967. 2 refs. (Appl. July 12, 1965, 6 claims).

A method is described for the catalytic production of free sulfur from dilute mixtures of hydrogen sulfide in the presence of C2 and heavier hydrocarbons, without seriously decreasing the catalyst activity. To achieve this, the sulfur dioxide content of the mixture is adjusted so that the H2S-SO2 ratio is from about 2 to about 2.5 to 1, and about 0.5 to 1 mol % oxygen is added. The resulting mix is then preheated to 425-450 F and contacted in a zone containing a catalyst for the reaction of H2S with SO2, to produce elemental sulfur at a temperature not greater than 550 F. Alternatively, the gas stream may first be subjected to direct oxidation at a maximum temperature of 800 F, the effluent from which is then subjected to the Claus reaction conditions described above. The processes are primarily directed toward sour natural gas as the gas mixture and bauxite as the catalyst.

7523 APTIC NUMBER 19342

Grenier, M. P.
LARGE CAPACITY METHANE LIQUEFACTION PLANT. (Appareils de liquefaction de methane de grosse capacite). Text in French. Preprint, Intern. Inst. of Refrigeration (Paris), 10p., 1968. (Presented at the International Congress on Refrigeration, 12th, Madrid, Spain, Aug. 30-Sept. 6, 1967.)

A pilot methane liquefaction plant, sponsored jointly by two French companies (L'Air Liquide and Gaz de France) went into service in 1963, using a fluid cycle called the 'autorefrigerated

cascade' (APC). This technique offers a number of advantages over the conventional cascade cycle, permitting a more complete use of plant power, a higher degree of adaptation to temperatures, natural gas content, and natural gas pressure. It requires only one compressor instead of several, a lower number of heat exchangers, a simpler piping system, and delivers a single fluid (liquefied natural gas), from which methane or other constituents can be separated by distillation.

7524 APTIC NUMBER 19686

Grennard, Alf H.
ANALYSIS OF INFORMATION OBTAINED FROM THE JAPANESE O.E.C.D. DELEGATES AND THEIR ASSOCIATES REGARDING DESULFURIZATION OF MINERAL OILS AND STACK GASES. (SIC). Organization for Economic Cooperation and Development, Paris (France), Rept. BC(69)-12, 71p., April 2, 1969. 26 refs.

The Japanese methods of removing sulfur from flue gases and residual fuel oils are discussed. Methods for desulfurizing stack gases include the Active Manganese Oxide Process and the Active Carbon Process. The development of stack gas desulfurization processes that will remove 90% or more of the sulfur in the flue gases are being investigated. There are essentially five methods in use to produce low sulfur fuel oils: selective blending of fuel oil components; conversion of high sulfur residuums by coking; vacuum gas oil hydrodesulfurization; deasphalted oil hydrodesulfurizarion; and direct residuum hydrodesulfurization.

7525 APTIC NUMBER 21997

Grindrod, J.
STORAGE OF LIQUID METHANE IN BRITAIN. Gas Age, no. 123:19-21, May 28, 1959.

To store the liquefied methane imported from the Gulf of Mexico into Britain, two heavily insulated tanks have been constructed of an aluminum alloy to contain the liquid gas at its boiling point of -260 F. The aluminum tank is enclosed in a mild steel tank some 6 ft greater in diameter and 10 ft higher to provide efficient insulation. Capacity of the tank is 90,000 cu ft of liquid, which is equivalent to over 60 million cu ft of gas. Welding was done of the 5% Mg alloy by the inert gas shielded consumable electrode process with special precautions taken in regard to cleanliness and freedom from moisture. There are two high level alarms, one electrically operated, set at 3 in. below maximum liquid level, the other, a float-operated pneumatic device which provides a warning at maximum liquid level and may also be used to operate an automatic shut-off valve in the inlet line. Pressure and vacuum relief valves are fitted to prevent air being drawn into the vessel; expansion bellows are provided at all tank connections to allow for relative movement due to thermal contraction. Before liquid methane at -260 F can be put into the tank in quantity, it is necessary to cool the tank almost to that temperature by spraying in liquid methane at a low rate of flow through atomizing nozzles just below the tank roof.

7526 APTIC NUMBER 21894

Guthmann, Kurt and Gerhard Will
TECHNICAL MEASURES OF AIR POLLUTION CONTROL IN THE IRON AND STEEL INDUSTRY. Commission of European Communities, Luxembourg (Belgium), 71p., June 1968.

The High Authority, until mid-1967 the executive body of the European Coal and Steel Community, headed a campaign for the control of dust and waste-gas pollution in the sectors for which it was responsible. It was charged with promoting production and safe working conditions of labor. It set up research programs for the technological control of dusts in mines and the iron and steel industry and has since subsidized many studies in this field. The results achieved by this Community-aided research are summarized and some of the iron and steel industry's difficulties are analyzed, particularly with respect to the technological and economic aspects of air pollution control. Sixteen studies were carried out in the sphere of dust and gas measurement. Nine of these were concerned with the comparison and improvement of dust measurement instruments and the development of new ones. Five were concerned with measuring dust concentrations at work locations. Two related to the emission and ground level concentration of dusts and gases. Considerable progress was made in the control of brown fumes to which 9 studies were devoted. Brown fumes are the waste gases produced when oxygen is blown in Bessemer convertors, open-hearth and electric furnaces. It is composed of minute iron oxide particles of a size comparable to tobacco smoke. Five studies were concerned with the control of other types of air pollution. Dust control methods adapted to the prevailing conditions proved very effective in sintering plants, in the conveyor-loading of blast furnaces, the discharging of fine ores from special skips and car tippers, and at the working area of the driver of the burden-charging carriage. An extremely irritating dust problem arising in the dry granulation of blast-furnace slag was solved in spraying the dust with water in a special suction hood.

7527 APTIC NUMBER 19380

Haenisch, Emil and Max Schroeder
PROCESS OF OBTAINING SULPHUR FROM FURNACE-GASES. (Assignee not given.) U. S. Pat. 361,761. 2p., April 26, 1887. (Appl. June 10, 1885, 1 claim).

A method of obtaining elemental sulfur from furnace gases containing sulfur dioxide is described. The SO2 is separated from the other gases by contacting it with water in a spray tower; the water absorbs the SO2, but no the other gases. The absorbed gas is separated from the water by heating. The gas is conducted over or through an incandescent bed of coke or coal to be reduced. It is then passed through a chamber containing glowing fire bricks, but no reducing agent. By using this process, only elemental sulfur and carbonic acid are formed.

7528 APTIC NUMBER 19291

Maensel, Vladimir
APPARATUS FOR TREATING AN EXHAUST GAS STREAM WITH DIFFERENT CATALYST BEDS. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,503,715. 7p., March 31, 1970. 7 refs. (Appl. April 5, 1968, 5 claims).

A converter-muffler device for the catalytic oxidation of engine exhaust gases, which may be high or low hydrocarbon concentration, is described. The device includes a converter chamber, an inlet port connected with an inlet manifold, and an outlet port connected with an outlet manifold. A perforated partition is situated between the two manifolds. The chamber contains a catalyst bed, adjacent to the inlet manifold, which consists of alumina particles containing 0.01% to 1.0% platinum as an activating component. A second catalyst bed is located next to the outlet manifold, and consists of alumina particles containing 0.1% to 1.0% platinum and 1.0% to 20% barium oxide. The particles in the second bed are slightly smaller than those in the first catalyst bed. The catalyst in the second bed also contains 0.13% to 0.70% by weight, based on the weight of the alumina, citric acid.

7529 APTIC NUMBER 19197

Hall, Herbert J. and Richard Jakoplic
METHOD AND APPARATUS FOR AUTOMATIC VOLTAGE CONTROL FOR ELECTROSTATIC PRECIPITATORS. (Research-Cottrell, Inc., Somerset, N. J.) U. S. Pat. 3,507,096. 13p., April 21, 1970. 20 refs. (Appl. March 7, 1967, 17 claims).

One of the basic problems encountered in the application of electrostatic precipitators relates to achieving stable, reliable, and effective wide-range automatic control of the voltage applied to the high-voltage transformer-rectifier which supplies the required high voltage to the electrodes of the precipitator. Substitution of solid-state counterparts for prior art elements in voltage control system has been less than satisfactory, particularly when used in high-power precipitator rectifier sets. A device which automatically controls an electrostatic precipitator by employing solid-state components in combination with a current limiting reactor is described. A delayed start and soft start means is provided for applying line voltage to the solid-state components before firing signals are supplied. A means is provided for making the firing signals responsive to operating parameters of an electrostatic precipitator, such as sparking rate, voltage, and current. This device provides stable, full-range, automatic voltage control especially adapted to the control of electrical energization of precipitators to achieve high-efficiency performance including sparking-load conditions and high-power operation.

7530 APTIC NUMBER 19933

Hall, Herbert J., Robert J. Brown, and Myron Robinson
METHODS AND APPARATUS FOR ELECTROSTATICALLY CLEANING HIGHLY COMPRESSED GASES. (Research-Cottrell, Inc., Bridgewater Township, N. J.) U. S. Pat. 3,511,030. 12p., May 12, 1970. 24 refs. (Appl. Feb. 6, 1967, 6 claims).

An electrostatic precipitator is described for the removal of fine suspended particles from gases at relative densities higher than generally considered possible. The device provides a stable corona over a wide range of relative densities and voltages beyond the critical point and at voltages below the accepted corona-starting voltages. The precipitator is comprised of fine discharge electrodes producing a negative corona to raise the sparkover voltage and critical relative density, heated discharge electrodes and flow constrictions for lowering the corona-starting voltage, and a high-voltage power supply within the compressed gas volume. Electrostatic precipitators exhibit many advantages over other collection equipment, and this particular precipitator has a wider operating range than previous ones.

7531 APTIC NUMBER 19340

Hangebrauck, Robert P. and Paul W. Spaite
POLLUTION FROM POWER PRODUCTION. Preprint, National Limestone Inst. Inc., 21p., Jan. 1970. 9 refs. (Presented at the National Limestone Institute, Inc., 25th Annual Convention, Washington, D. C., Jan. 21-23, 1970.)

Emissions resulting from combustion, especially combustion of coal, are a large and growing factor in increasing air pollution levels. Sulfur oxides, nitrogen oxides, and fine particulate matter will increase several fold over the next three or four decades, even if development of nuclear power generation is extremely rapid, but the most immediate and serious problem is posed by sulfur oxides. Coal cleaning for the immediate future, coal or lignite gasification or conversion for possible application further in the future, and liquefied natural gas importation need attention in fuel resource management. Both 'throwaway' and product-producing processes need rapid development and application. New combustion processes, such as those using fluid beds may make better use of limestone in the dry state. Although combustion design and modification techniques are available for partial control of nitrogen oxides emissions from gas- and oil-fired power plants, no control technique for coal-fired plants is under development. Methods of controlling particulates include the use of electrostatic precipitators, with and without mechanical collectors. Scrubbers and fabric filters for use in power plants are being evaluated while dry limestone injection and wet limestone scrubbing processes for control of sulfur oxides will be available shortly. The dry limestone injection process consists of equipment to pulverize limestone, and inject and distribute it into the high temperature furnace gases. It is calcined and reacts with SO2 and oxygen to form calcium sulfate which is collected with the fly ash in the dust collector equipment. The wet scrubbing process is a more likely choice where higher sulfur oxides removal is required. Costs of controlling sulfur oxides are also discussed.

7532 APTIC NUMBER 19486

Hara, Haruichi
RESEARCHES ON CONTACT REACTION RATE FOR SO2-OXIDATION. Ann. Genie Chim., 1967:187-196, 1967. 6 refs.

The velocities of contact reaction rates for sulfur dioxide oxidation over vanadium pentoxide-industrial catalyst were measured for both forward and reverse reactions using a differential reactor. For gas phase reactions, an approximate rate formula of catalytic reaction was derived theoretically in case of the reactions being in stationary state and having no side and no consecutive reactions. Results of applying the derived formula to the experimental data and to many reactor designs for sulfuric acid factories in Japan were satisfactory. (Author abstract modified)

7533 APTIC NUMBER 19419

Harrell, Joseph W.
TREATING HYDROGEN-SULPHIDE CONTAINING GASES. (Standard Oil Development Co., Elizabeth, N. J.) U. S. Pat. 1,915,364. 4p., June 27, 1933. (Appl. July 23, 1932, 6 claims).

Part of a hydrogen sulfide-rich gas (over 70% H2S by volume) to be treated is passed to a combustion zone and burned with excess air. The combustion gas is cooled and sulfur dioxide absorbed from it by contact with water to obtain an aqueous SO2 solution which is passed into a reaction zone. The remainder of the H2S-rich gas is also passed to the reaction zone to obtain elementary sulfur by the reaction of the dissolved SO2 and the H2S. An excess of H2S is maintained over that needed for the reaction; this residual gas is separated from the aqueous slurry of sulfur and returned to the combustion zone. The sulfur is removed from the aqueous slurry. Combustion is carried out under a pressure of 5-30 psi; the reaction zone is held under a lower pressure than the combustion zone. The combustion gases are cooled to a temperature of below about 120 F before the absorption.

7534 APTIC NUMBER 19195

Hashimoto, Kiyotaka
ENGINEERING IN GAS-AEROSOL TREATMENT AND ITS EFFECT ON AIR POLLUTION CONTROL. (Ensu shori gijutsu to kogaiboshi koka). Text in Japanese. Kinzoku (Metals) (Tokyo), 40(13):76-81, July 1, 1970. 25 refs.

Engineering progress in gas-aerosol treatment is discussed, together with the application of the treatment for wastes produced by various metal refining processes. Gaseous waste produced by metal refining processes can be grouped into two refining types: (1) nonmetal substances, including W, Fe, Sn, Cu, Mn, Al, Ag, and Ni which can be treated by a high level of boiling point; and (2) substances such as Hg, As, P, Zn, Cd, K, Na, Se, and S, which can be treated by dust filtering after it is reduced to its gaseous form and then set in a liquid or powder form after cooling. The second refining type involves a problem in that substances evaporating in a boiler are for the most part oxidized on cooling and formed into aerosols with a wide square surface. Due to its high level of electric resistance, the surface is not readily filtered by an electric filter at low temperature. The effect of gas-aerosol treatment on air pollution control in refining process is also considered with Pb, Zn, Ci, Co, and other elements. Engineering for gas-aerosol treatment is reviewed in reference to evaporation refining, electrolysis refining, and powder metallurgy are also discussed. It is concluded that technical progress in gas-aerosol waste treatment is sufficient to promote air pollution control to a great extent.

7535 APTIC NUMBER 21724

Hendrickson, E. R., J. E. Roberson, and J. B. Koogler
CONTROL OF ATMOSPHERIC EMISSIONS IN THE WOOD PULPING INDUSTRY. VOLUME 3. (FINAL REPORT). Environmental Engineering, Inc., Gainesville, Fla., and Sirrine (J. E.) Co., Greenville, S. C., Contract CPA 22-69-18, 250p., March 15, 1970. 418 refs.
CFSTI: PB 190353

Chapters 9 through 13 are contained in this third and final volume of a study of control of wood pulping emissions. Chapter 9, which includes 237 references, reviews sampling and analytical techniques, grouped under emission source or ambient conditions, for kraft, sulfite, and NSSC pulping processes. For each grouping, recommendations are made of the best available procedures. An annotated bibliography of 174 papers related to on-going research in pulping emissions control comprises Chapter 10; references are grouped under eight subjects. Recommendations for future research and development are made in Chapter 11. Chapter 12 presents estimates of present pulping industry investment and operating costs for emissions control. The cost analyses are based on prices of chemicals and equipment as of Jan. 1969. Chapter 13 reports the development of a model which provides data applicable for projections of investment and operating costs for emission control in the kraft pulping industry through 1980. A sensitivity analysis suggests how the costs for emission control are influenced by emission standards, value of recoverable chemicals, and assumed rate of return. A mathematical programming model is also presented, by which it is possible to determine for any specified mill the optimal way to satisfy specified emission standards and maximize net revenue from emission control. An an example is analyzed with the model, using the 1969 Oregon regulations and based on Jan. 1969 prices.

7536 APTIC NUMBER 21728

Hendrickson, E. R., J. E. Roberson, and J. B. Koogler
CONTROL OF ATMOSPHERIC EMISSIONS IN THE WOOD PULPING INDUSTRY. VOLUME 2. (FINAL REPORT). Environmental Engineering, Inc., Gainesville, Fla., and Sirrine (J. E.) Co., Greenville, S. C., Contract CPA 22-69-18, 266p., March 15, 1970. 45 refs.
CFSTI: PB 190352

Chapters 5 through 8 are contained in this second of three volumes of a study of control of wood pulping emissions. Chapter

5 reviews methods currently in use for particulate and gaseous control. Evaluation of each method includes a cost and effectiveness study, as well as discussion of engineering factors unique to specific applications. New methods, which have had limited or no application within the U. S. but which may show promise for future use, are described in Chapter 6. Order of magnitude costs are developed for comparison purposes. In Chapter 7, overall control technology is critically discussed, with the relative merits and specific limitations of the most effective and economical methods summarized. An example of selected kraft process configurations to meet selected emission limitations is analyzed. Evaluation parameters are applicable emission sources, efficiency, flexibility, economics, reliability, and adaptability. Chapter 8 discussed processes for flue gas desulfurization and possible recycling of the sulfur in the pulping process. It is concluded that none of the processes reviewed are feasible for application in the foreseeable future.

7537 APTIC NUMBER 19717

Henke, Jakob
EQUIPMENT FOR EMBANKING AND CONFINING OIL SLICKS ON WATER SURFACES. (Vorrichtung zur Abgrenzung und Findaemmung von mit Oel verseuchten Wasserflaechen). Text in German. (Assignee not given.) Swiss Pat. 477 604. 3p., Aug. 31, 1969. (Appl. Nov. 13, 1967, 6 claims).

Equipment was devised for embanking and confining oil slicks on water surfaces. It consists of a band of plastic foil with floating buoys on top, burdens attached underneath, and two pairs of drums for winding and unwinding of the band. The spacing of each drum of a pair can be adjusted. The axles of each drum pair are connected by a rubber band, and one of the drums of each pair is driven manually or by a motor. The drum pairs are arranged on both sides of an oil recovery ship, and can be lifted into the water for unwinding of the band. Oil slicks with lengths of 800 m (250 m diameter, 48,000 sq. m) and more can be confined.

7538 APTIC NUMBER 19395

Hewson, G. W. and R. Ll. Rees
SOME CONTRIBUTIONS OF CHEMISTRY AND CHEMICAL ENGINEERING TO STEAM GENERATION. Trans. Inst. Chem. Engrs. (London), vol. 17:43-79, 1939. 61 refs. (Presented at the Institution of Chemical Engineers Annual Corporate Meeting, 17th, London, England, Feb. 17, 1939.)

Four problems in the operation of steam power plants are discussed: the evaluation of fuel, the efficient combustion of fuel, the treatment of boiler water, and the removal of sulfur oxides from flue gases. Two different philosophies of SO2 removal are considered in the discussion of the operation of two large steam electric plants. While both handled the SO2 as disposable waste, one was mainly concerned with the absorption of SO2 in water, the absorption in acid condition being aided by the catalytic action of iron. The solution was neutralized as far as possible by the calcium carbonate content of Thames river water, with a final touching-up by scrubbing with calcium carbonate. The other adopted a non-acid treatment, washing with water that was maintained neutral or slightly alkaline. The subject of recovery and sale of sulfur or sulfur products was brought up during the discussion period and mention was made of the extensive and varied approaches to this problem which were in the research or pilot-plant stage. The economics and technical feasibility of coal desulfurization was brought up during the discussion period. Comment was also made to the effect that the United States would have an even more difficult problem in this area than England, since the American coal contained 5 times the sulfur content of Welsh or Scottish coal and the sulfur content was increasing. Comment was also made concerning the lack of public concern on the subject of SO3 fumes in America.

7539 APTIC NUMBER 19643

Hilliard, R. K., L. F. Coleman, C. E. Linderoth, J. D. McCormack, and A. K. Postma
REMOVAL OF IODINE AND PARTICLES FROM CONTAINMENT ATMOSPHERES BY SPRAYS -- CONTAINMENT SYSTEMS EXPERIMENT INTERIM REPORT. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., Rept. BNWL-1248, 216p., Feb. 1970. 48 refs.

The experimental data obtained in five aqueous spray experiments in the Containment Systems Experiment Vessel, a 30,000-cu ft vessel which permits spray experiments at either full scale or within a factor of four of full scale, are reported in detail. The objective of these tests was to verify theoretical models capable of predicting the removal by sprays of fission products from the atmospheres of large power reactor containment vessels under postaccident conditions. The performance of caustic-borate sprays in decontaminating the containment atmosphere of elemental iodine, methyl iodide, particulate iodine, cesium, and uranium is discussed in terms of theoretical models. Parameters investigated were spray flow rate, spray drop size, atmosphere temperature and pressure, and chemical composition of the spray solution. Removal rates were in agreement with predictions by mathematical models based on mean spray drop diameters. Large concentration reduction factors (greater than 1000) were obtained for all species except methyl iodide, which was removed only slowly by the caustic sprays. Based on these experiments, the models predict 2-hr time-integrated dose reduction factors attributable to continuous sprays in a large power reactor building ranging from 1.5 for methyl iodide to 50 for elemental iodine, with intermediate values for cesium, uranium, and particulate iodine. (Author abstract modified)

7540 APTIC NUMBER 19324

Hiraoka, Masakatsu, Yoshizo Matsuno, and Tetsuo Hanakawa
AN ANALYSIS OF ADSORPTION MECHANISM OF SULFUR DIOXIDE BY ACTIVATED CARBON. Trans. Soc. Heating, Air-Conditioning, and Sanitary Engrs. (Japan), vol. 7:51-59, 1969. 9 refs.

The equilibrium relationship between sulfur dioxide and particles of activated carbon was determined at 20, 30, and 60 C. The

results were fitted to a Freundlich-type equation. Adsorption rates of SO2 into a bed of activated carbon were measured by a transient method in which the total volume of gas is absorbed in a 5% solution of hydrogen peroxide and titrated to obtain the accumulated concentration. Break-through curves were obtained by the differentiation of the curve of the accumulated concentration versus time and were compared with the theoretical results. Analysis of the data indicates that the external diffusion is the controlling factor at the initial state of adsorption and the pore diffusion process is the controlling factor at the final stage of adsorption for particles larger than 0.1 cm.

7541 APTIC NUMBER 19212

Hishida, Kazuo
AIR POLLUTION CONTROL EQUIPMENT FOR FLUORIDE AND FLUORIDE PROPERTIES. (Fusso kagobutsu no seijo to sono jogai shisetsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(7):521-530, July 15, 1970.

Guidelines issued by a local government recommend that processing plants choose economical and practical installations for purifying exhaust gas. A guideline for plants processing fluorides is described. A jet scrubber or a spray tower is recommended for cleaning by water. The standards for fluoride concentration in plants are 15 ppm at the maximum and 10 ppm on the average. After a detailed description of the general properties of fluorides including hydrogen fluoride, hydrofluoric acid, silicon fluoride, and hexafluoro silicic acid, their effects on health are reviewed, together with the maximum permissible concentration of threshold values. A 3-stage floating-bed type of wet scrubber, which is employed by a hydrogen fluoride manufacturing plant in Tokyo, is schematically illustrated. Also described are principles of removing or recovering fluorides, apparatus for absorbing fluorides, anti-corrosive materials for the apparatus, processing of the water used to remove fluorides, re-use of the cleaning water, and the use of alkaline solutions for cleaning. Unit operations in the plant, which give rise to fluoride pollution, are tabulated. In addition, various local government standards for harmful gases and particulates are noted.

7542 APTIC NUMBER 19919

Hoefig, Reinhard and Johannes Piedel
SYSTEMATIC PREVENTIVE MAINTENANCE OF AIR EQUIPMENT. (Planmaessig vorbeugende Instandhaltung Lufttechnischer Anlagen). Text in German. Giessereitechnik, 16(3):84-86, 1970.

A plan known as PVI (Systematic Preventive Maintenance) was recently worked out for use in the main plant of VEB Kombinat Stahlguss, a steel foundry company. The plan was developed in response to administrative problems in the company, where the lines of responsibility for the maintenance and repair of air-cleaning equipment previously had not been clear. A schedule was devised for the various phases of this work, classified under the headings of periodic checking, day-to-day repairs, medium repairs, and general repairs. The plan is suggested as a rough model for devising solutions to similar problems in other plants.

7543 APTIC NUMBER 19355

Hoffman, George A.
BUS DESIGN IMPROVEMENTS FOR THE BENEFIT OF NON-USERS. Organization for Economic Cooperation and Development, Paris, France, Directorate for Scientific Affairs, Proc. First Technol. Assessment Rev., 1969, p. 143-158. 9 refs. (Presented at the International Automotive Engineering Conference, Detroit, Mich., Jan. 13-17, 1969.)
CFSTI: PB 188030

Inconveniences to the bus non-user are described, including the high cost of subsidies needed to maintain the service, the bulk of the vehicle in the city streets, its distracting noise, and the noxious exhausts; alternate choices in a propulsion powerplant are discussed. The diesel engine is several times heavier than the electric motor, steam engine, or gas turbine of comparable power, and in its rearmost location it requires adding two wheels, much frame reinforcing on overhangs, and more power to accelerate its own mass. Substitution of electric traction motors in place of the internal combustion piston engine would eliminate the exhaust and mute much of the noise. The battery-operated bus capable of 8 to 12 hours operation before needing battery recharge or replacement emerges as the most attractive of these configurations, particularly in view of recent advances in producing high-efficiency batteries. With the diesel's mass redistributed lengthwise in the form of batteries, the center of gravity moves forward to more nearly amidship, and the more uniform weight distribution permits lightening frames and structures, employing only four wide-tread tires, and far less wheel-well intrusion into passenger space. The possibility of producing controls providing smooth jerk-free acceleration, cruise and deceleration at over 90% conversion efficiency is well established, but there is no assurance that their acquisition costs might be comparable to those of the transmission and accessories of the diesel engine. If advanced batteries fail to develop into practical application, a low-cost scheme would be to electrify the bus from overhead lines when it is travelling in the denser central districts of the city, and to run it on the ready-made but weighty batteries only when it is in outlying areas.

7544 APTIC NUMBER 19206

Hooper Robert P. and Vernon L. Arne
FOREIGN PARTICLE SEPARATOR FOR AN AIR MOVING MEMBER. (Boeing Co., Seattle, Wash.) U. S. Pat. 3,513,641. 9p., May 26, 1970. (Appl. Aug. 22, 1968, 5 claims).

A separator is described for removing foreign particles from an airstream which is adapted to provide a continuous untortured flow path for the particles. The problem of ingested foreign particles, including moisture, is universal to all types of gas turbine usage, but the problem is particularly troublesome in helicopter applications. A satisfactory separator must provide maximum separation with a minimum of pressure loss, which is here obtained by angling the trap passageway and disposing the entrance of the

trap which received the particles so that it faces the entering air. This apparatus also utilized a bounce plate to direct the heavier particles such as birds which fall from the entering air due to gravity and the downwash of the helicopter into the entrance of the trap. The entrained moisture is directed into the trap before it has an opportunity to touch or contact any other portion of the air inlet. Results of this arrangment are immediate and consequently the formation of ice is also avoided. Tests have resulted in approximately 87% of all particles being separated from the air flowing into the power plant without any secondary flow, a power loss of about 0.6% and a pressure loss of approximately 0.3%.

7545 APTIC NUMBER 19563

Howard, William H.
RECOVERY OF SULPHUR. (Assignee not given.) U. S. Pat. 1,685,231. 2p., Sept. 25, 1928. (Appl. Aug. 20, 1927, 7 claims).

A method of reducing sulfur dioxide to elemental sulfur is described. The reducing material must be maintained at a temperature of 1200-1300 C for a rapid reduction, but furnace gases contain insufficient oxygen to support combustion sufficiently to maintain the required temperature for the reducing action. Impure furnace gases are transferred in this procedure to a stream of pure air to produce a combustion-supporting gas. The gases are washed with water in a countercurrent system to dissolve the SO2 and this solution is then contacted with air in a second countercurrent system to transfer the SO2 to the air. Packed towers are used for the absorption and desorption of the SO2. The resultant mixture of air and SO2 is passed through an incandescent bed of coke at such a rate that a temperature of 1200-1300 C is maintained. As the gas mixture passes through the coke, substantially all of the SO2 is reduced to elemental sulfur which may be collected in flues or chambers.

7546 APTIC NUMBER 19329

Humbert, Kingsley E., Jr. and Ernesto Buonopastore
AIR FILTER. (Wix Corp., Gastonia, N. C.) U. S. Pat. 3,508,383. 5p., April 28, 1970. 14 refs. (Appl. Feb. 15, 1968, 6 claims).

An air filter which deflects the larger particles away from the filter media is described. Air entering the filter is deflected by means of a deflector, which causes the air to assume a swirling motion. The heavy or large particles are forced away from the filter media. This tends to prolong the life of the filter, prevent cuts or tears in the filter, and prevent clogging. Previous filters required frequent cleaning or replacement; the filter described greatly reduces down-time, thus increasing operating time and efficiency.

7547 APTIC NUMBER 19584

Hunt, J. W.
THE TECHNIQUES AND RUDIMENTARY ECONOMICS OF TRANSPORTING LIQUEFIED NATURAL GAS BY SEA. J. Inst. Petrol. (London), 52(508):111-123, April 1966. 5 refs.

After a description of the Algeria-Britain-France liquefied natural gas project, techniques for liquefaction, storage, and shipping of LNG are discussed; finally, some approximate ranges for investment and operating costs are used to demonstrate the influence of LNG quantity and shipping distance on unit costs. Costs factors for liquefaction are plant investment, storage facility, operating costs, plant fuel consumption, and specific gravity and calorific value. Shipping cost factors include ship investment and operating costs, port charges, ship characteristics, and boiloff rates. With further assumptions as to feed-gas price, project life, capital charges, and taxes, unit costs of delivered gas can be calculated. The economies of scale are evident, as well as the effects of distance on capital investment, and support the conclusion that costs must be reduced for LNG to remain competitive. Even with technological improvements, projects involving longer shipping distances or smaller trade volumes are not likely to be viable without low feed-gas prices, liberalized depreciation methods, and some tax concessions.

7548 APTIC NUMBER 19538

Hunter, J. E., I. W. Buddenhagen, and Evelyn S. Kojima
EFFICACY OF FUNGICIDES, HOT WATER AND GAMMA-IRRADIATION FOR CONTROL OF POSTHARVEST FRUIT ROTS OF PAPAYA. Plant Disease Reptr., 53(4):279-284, April 1969. 17 refs.

The incidence of postharvest fruit rots of papaya was reduced approximately 50% by 2-minute dips in a 2-aminobutane carbonated solution (1% active material) at 40 C, pH 10.5; or by fumigating with 2-aminobutane for 2 hours at 300 ppm. Higher rates resulted in better control but fruits failed to degreen evenly. Significantly better control was obtained by submerging fruits in water at 118-120 F for 20 minutes. Similar water treatment at 114-116 failed to control rots. Gamma-irradiation treatment (75-100 krads), alone or in combination with hot water or 2-aminobutane, effectively extended fruit shelf-life but had limited fungistatic effect. Higher levels of irradiation were injurious to fruits. Rhizopus fruit rot was controlled with 2,6-dichloro-4-nitroaniline dips at 1000-2000 ppm. (Author abstract)

7549 APTIC NUMBER 19283

Ichihara, Kiyoshi
A METHOD OF SEPARATION AND REMOVAL OF CARBON MONOXIDE FROM A MIXTURE OF GASES. (Issankatanso o ganyusuru kongogasuyori issankatanso o bunri kaishusuru hoho). Text in Japanese. (Hitachi Manufacturing Co. (Japan)) Japanese Pat. Sho 45-3650. 3p., Feb. 6, 1970. (Appl. Feb. 18, 1964, claims not given).

The physical method of recovering carbon monoxide by condensation at low temperature and its subsequent evaporation is presented. Because of the considerable fluctuations in composition of the gases to be treated, the process has not been applied to this type of mixed gases. The present process is primarily aimed

at recovering carbon monoxide from the waste gas produced in manufacturing acetylene by a partial oxidation of natural gas. After passing through a cooler, the gas, cooled to -165 - -170 C, is divided into parts. One part of the gas is heated again to -90 - -100 C by passing through the higher temperature tube of the cooler. Subsequently, this part of the gas is again cooled by a fractionating column to a temperature more than 5 C lower than that of the gas originally cooled. After this heating and cooling cycle, both parts of the gas are joined together and led to a heat exchanger. Exchange of heat takes places between the gas and a separated gas going back to the cooler. The present process is more economical than the two conventional methods of recovering carbon monoxide, that is, chemical cleansing by a copper solution or liquefaction by deep freezing.

7550 APTIC NUMBER 19235

Iinoya, Koichi, Kazutaka Makino, Osamu Inoue, and Tsutomu Imamura
DUST COLLECTION PERFORMANCE OF PAPER FILTERS. (Roshifiruta no shujin seino nitsuite). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 34(6):632-637, June 5, 1970. 7 refs.

A number of commercial paper filters were studied, and the results are discussed by applying the theory of dust collection performance of a single fiber. Simple dispersion particles of stearic acid, 0.25-1.3 micron in diameter, were generated by Laser's apparatus. Particle density was monitored by a digital dust counter. The pressure drop across clean paper filters and overall penetration were plotted against the superficial velocity. High performance filters gave less than half of the pressure drop of middle performance ones. Included in the study were the effect of volume fraction of a fiber in a filter on the collection efficiency of a single fiber, the relation between the incremental ratio of a pressure drop across a filter and dust load, and the relation between the incremental ratio of a coefficient of the stream function and the volume fraction of a fiber in a filter. The logarithmic transparency held for the thickness of the filter, but not for compactness, while the pressure drop was determined by the dust load on the filter. A relation between the ratio of the collection efficiency of a single fiber to that of an isolated fiber and the volume fraction of fiber in the paper filter was obtained.

7551 APTIC NUMBER 19404

Inaba, Tetsuo and Kazuo Kono
THE MECHANISM OF WET TYPE ROASTING OF PYROLOTITE. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), vol. 58:952-959, 1955. 8 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 32p., May 4, 1970.

The reaction kinetics and mechanism for the reaction of pyrolotite (FeS) and steam are considered both theoretically and on the basis of laboratory experiments. The heat of dissociation for FeS and H2S are derived, as are the dissociation temperatures. When FeS reacts with steam, H2S is produced as a pseudo-zero order reaction. Then the H2S dissociates as a first order reaction or as the sum of a first and second order reaction and SO2 gas is produced. When reaction time is short, the second order reaction is of little consequence. Sulfur is produced at the low-temperature point of the system. Therefore, roasting of pyrolotite with steam should be conducted using large amounts of steam and a low flow rate to maintain equilibrium within the system.

7552 APTIC NUMBER 19708

CONTROL OF AUTOMOTIVE EXHAUST EMISSIONS. Innovation, 1(3):14-16, Spring 1970.

An emission control system for use with the internal combustion engine is described, which will meet the Federal standards for hydrocarbons, carbon monoxide, and nitrogen oxides for 1975. The exhaust manifold thermal reactor comprises an outer shell, a tubular core, and a shield to insulate the hot core from the outer shell. Exhaust gases mixed with air supplied by an air injection system enter the tubular core designed to promote mixing and to initiate oxidation. The reactive gases then pass sequentially through the spaces between the core and the shield and between the shield and the outer shell. Oxidation of hydrocarbons and carbon monoxide to water and carbon dioxide is completed during this passage before the gases exit into the conventional exhaust system. Problems and experiments concerned with the design of the components within the shell are discussed. Because temperatures inside the reactors are 1650 F during normal operation, the inner core must be constructed of materials that can withstand these temperatures for long periods, and sensing devices are necessary to warn of engine malfunction. Recirculation of a portion of the exhaust gases to the engine intake system dilutes the fuel-air mixture and effectively reduces the formation of nitrogen oxides. To control particulate matter emitted from vehicles, the exhaust gas is cooled during passage through the exhaust pipe so that the particulate matter becomes solid and thus separable from the remainder of the exhaust gases. The exhaust stream is then passed through a box filled with wire mesh to cause the particles to collide and agglomerate into larger particles; the agglomerated particles are then removed from the stream in a cyclone separator and retained in a collection box.

7553 APTIC NUMBER 19259

Inoue, Kiyoshi
A DESULFURIZATION APPARATUS. (Datsuryusochi). Text in Japanese. (Japax Co. (Japan)) Japanese Pat. Sho 45-2657. 2p., Jan. 29, 1970. (Appl. March 1966, claims not given).

A laser was employed to separate and remove sulfur from hydrocarbon mineral oils such as a heavy crude oil. The laser was immersed in the oil together with a pumping system for exciting the laser. The wavelength of the laser beam employed was 6974 A, which is close to the resonance frequency of sulfur. When sulfur atoms on molecules were irradiated by the laser, they were brought to oscillation with little loss. Since the bonding energy of sulfur with hydrocarbon molecules is low,

the irradiated sulfur forms a bond with surrounding hydrogen or oxygen to form hydrogen sulfide, carbon disulfide, or sulfur dioxide. These gases are pumped out of the processing chamber. In one experiment, crude oil containing 3.6% sulfur was passed through a processing chamber at the rate of 5 l/min. A 10 mm in. diameter, 75 mm long Al2O3.Cr doped crystal was pumped by a xenon discharge tube at the rate of two times per sec. Hydrogen-sulfide gas at a 6.8% concentration was generated. After 30 min processing of the 30 oil, the sulfur content was reduced to 2.1%. When an ultrasonic oscillator was immersed together with the laser, the effect was further multiplied. The apparatus is simple and inexpensive, reducing processing costs considerably.

7554 APTIC NUMBER 19234

Iwata, Yoshiaki
PRODUCTION PRINCIPLE OF PERFECTLY CLEAN AIR AND A COUNTERMEASURE FOR THE PREVENTION OF PUBLIC NUISANCE. (Kanzen seijo kuki no seizorinen to kogai bojo no issaku). Text in Japanese. Kuki Chowa Eisei Kogaku (J. Japan Soc. Heating, Air Conditioning and Sanitary Engrs.), 44(5):365-370, May 25, 1970.

A new method of cleaning air by adsorption with artificial rain is presented. The basic idea is to remove ultra-fine particulates of less than 0.3 micron from air by forming a mist. The particulate becomes the nucleus of a water droplet, seen in rain or snow. Outside air is mixed with room air and led to the primary air-cleaning chamber, where most of the pollutants are removed by humidification. After heating, the air is humidified in the secondary air-cleaning chamber which is equipped with a heat exchanger. When the humid air near the saturation point is cooled, a temperature decrease does not occur in water vapor because of its large latent heat. Solids such as dust, however, are quickly cooled because of their low latent heat, and absorb the heat of the supercooled vapor. Thus the dust is covered with water, the water droplet grows in size as cooled, and falls downward. The small size of the initially formed water droplets, and the low temperature and humidity of the ambient atmosphere are the main features of this system, enabling the removal of ultra-fine particulates and gaseous pollutants. This method was contemplated in 1967, a patent application made in 1968, and brought into operation for a large electronic factory in the summer of 1969.

7555 APTIC NUMBER 19083

Jackson, R. G.
FROZEN GROUND STORAGE FOR LIQUEFIED NATURAL GAS AT ARZEW, ALGERIA. Preprint, Intern. Inst. of Refrigeration, Paris, 7p., 1968. 2 refs. (Presented at the International Congress on Refrigeration, 12th, Madrid, Aug. 30-Sept. 6, 1967. Paper 17/989.)

Construction and performance of the underground storage unit for liquefied natural gas at Arzew, Algeria, are reviewed. The storage, which has a capacity of 240,00 bbls, is 122 ft in diameter and 114 ft deep. Its base is insulated with 'Foamglas', which is prevented from floating by a covering of concrete bricks. The cavity is covered by a flat, ribbed aluminum-alloy roof that is suspended from a carbon steel framework, the ribs of which begin and end in a continuous steel ring beam. The ring beam is supported by a reinforced concrete wall which surrounds the cavity. The cavity was excavated from ground consisting of a 9-ft layer of sandy oil above a 12-ft layer of sandstone. Freezing began with a single ammonia compressor, which was able to cool the brine to just below 32 F, and two other compressors were brought into operation within a month and the refrigerant temperature dropped to about -4 F. There followed a gradual further reduction until stabilization between -13 and -14.8 F was attained. No problems were encountered during freezing and the storage system has performed well, although the boiloff is higher than that encountered in aboveground storage. This disadvantage is offset by the lower initial cost of ground storage and the greater degree of safety inherent in the system.

7556 APTIC NUMBER 21974

Jenness, L. C. and J. G. L. Caulfield
THE ABSORPTION OF SULPHUR DIOXIDE IN WATER. Tappi, 109(26):345-349, Dec. 28, 1939. 9 refs. (Presented at the Technical Association of the Pulp and Paper Industry Fall Meeting, Syracuse, N. Y., Sept. 12-14, 1939.)

Coefficients of absorption of sulfur dioxide in water were determined in a tower packed with one-inch Raschig rings, covering an approximate range of liquor velocity from 0.09 ft/min to 0.69 ft/min with gas velocities varying from 0.037 ft/sec to 0.30 ft/sec. The coefficient varied at fixed liquor velocities as a power function of the gas velocity, the exponent occurring at higher gas velocities. The coefficient varied as a power function of the liquor velocity at fixed gas velocities, with higher values of the exponent of the gas velocity increasing at higher gas velocities. Resistance to absorption was appreciably in the liquid film at low liquid velocities, but shifted to the gas film at high liquid velocities. (Author abstract modified)

7557 APTIC NUMBER 19026

Jesionek, R.
REMOVAL OF FUMES RISING FROM THE ELECTRIC FURNACES OF THE BREUIL STEEL PLANT. (Aspiration des fumees sur les fours electriques de l'acierie du Breuil). Text in French. Centre Doc. Siderurg., Circ., Inform. Tech., 26(1):229-235, 1969. 1 ref.

Breuil's third electric furnace was installed in 1961 without any provision for the recovery of fumes, and the two blowers installed on the roof were found inadequate, necessitating immediate further study. Together with the experience of the company in operating the earlier furnaces with aspirators, it was decided to use the same type of aspiration equipment for the new furnace which had a capacity of 80 tons, as compared with 60 tons for the two earlier furnaces. This meant relinquishing some alleged advantages in omitting the aspiration equipment,

such as an increased lifetime for the dome, airspeed of fusion, decreased power consumption, and a more stable consumption of electrodes. The observations, experimental findings, and steps taken to minimize the disadvantages of aspiration are given in detail.

7558 APTIC NUMBER 19720

Joergensen, Sven Erik
METHOD FOR THE RECOVERY OF OIL AND/OR FAT FROM WASTE WATER. (Verfahren zur Gewinnung von Oel und/oder Fett aus Abwaessern). Text in German. (A/S Apothekernes Lab. for Specialpraeparater, Oslo (Norway)) Swiss Pat. 478 910. 3p., Sept. 30, 1969. (Appl. Oct. 21, 1966, 3 claims).

A method was devised for the recovery of oil and/or fat from the waste water of fish meal factories, the fish canning industry, slaughterhouses, and dairies. It is characterized by adding lignin-sulfonic acid or a derivative of it to the waste water prior to separation by which the pH of the waste water is adjusted to between 2.0 and 4.5, preferably 3.0. The temperature of the waste water is brought to between 80 and 100 C, and the fat or oil emulsion is broken down with a larger amount recovered than by separation alone. Residual fat or oil concentrations of as low as 0.02 to 0.2% could be achieved in practice.

7559 APTIC NUMBER 19473

Johnstone, H. F.
METALLIC IONS AS CATALYSTS FOR THE REMOVAL OF SULFUR DIOXIDE FROM BOILER FURNACE GASES. Ind. Eng. Chem., 23(5):559-561, May 1931. 7 refs.

The use of metallic ions as catalysts for the absorption of sulfur dioxide from stack gases was investigated. Air containing 0.325% SO2 was passed at a constant rate through three liters of water containing the catalyst. The catalyst concentrations varied from 0.028 to 4.2 g/l of the metallic ion. In concentrations as low as 0.0028%, manganese ions exert a strong catalytic action, increasing the capacity of the water for absorbing SO2 by 600%. The catalytic effect of ferric ions is less than that of manganese. Definite promotor action is shown when a small concentration of manganese is added to dilute ferric solutions. A trace of copper ions inhibited the action of manganese in any concentration, but they had no effect on catalysis by ferric ions. The presence of zinc, nickel, chromium, or alkali metal ions neither inhibits nor promotes the catalysis by manganese ions. Application of the laboratory results was made with a small single-effect rotary scrubber. Although the efficiency was much lower than that of the laboratory scrubber, it compared favorably with that obtained by other large-scale methods.

7560 APTIC NUMBER 19014

Johnstone, H. F. and A. D. Singh
RECOVERY OF SULFUR DIOXIDE. Ind. Eng. Chem., 29(3):286-297, March 1937. 24 refs.

Measurements of the rates of absorption and heat transfer and of the resistance to gas flow were made for a number of arrangements of (a) vertical smooth plates, (b) vertical corrugated plates, with horizontal corrugations, set at various spacings and with different depths and frequencies of corrugations, (c) grid surfaces with various channel dimensions and arrangements, and, for comparison, (d) ordinary tower packing such as Raschig rings, spiral rings, and wire helices. The absorption data on sulfur dioxide by alkaline solutions, and on ammonia by acid solutions were accurately correlated with heat transfer data by the Chilton-Colburn equation. Taking all factors into consideration, the most desirable packing of those studied for handling large quantities of flue gases is composed of grids with 1.5-inch channels and with individual sections from 4 to 6 inches high. (Author abstract)

7561 APTIC NUMBER 19023

Johnstone, H. F.
RECOVERY OF SULFUR DIOXIDE FROM WASTE GASES. Ind. Eng. Chem., vol. 27:587-593, 1935. 11 refs.

The partial vapor pressures of a range of concentrations of ammonia and relative concentrations of sulfur dioxide in solutions of the ammonia-sulfur dioxide-water system were measured. For the concentrations encountered in the cyclic process of absorption of sulfur dioxide from waste gases and regeneration by distillation, the partial pressures may be expressed by formulas involving concentrations of ammonia and sulfur dioxide and a constant. The partial pressure of water follows Raoult's law. In the range of concentration considered, the effect of temperature on the vapor pressure of sulfur dioxide is practically independent of the nature of any completely ionized electrolytes present. The capacity of these solutions for absorbing sulfur dioxide from 0.3% gases may be as high as 8 lb/100 lb of solution. (Author abstract modified)

7562 APTIC NUMBER 19393

Johnstone, H. F.
RECOVERY OF SULFUR DIOXIDE FROM WASTE GASES. Ind. Eng. Chem., 29(12):1396-1398, Dec. 1937. 2 refs. (Presented at the American Chemical Society National Meeting, 94th, Rochester, N. Y., Sept. 6-10, 1937.)

The application of various solutions as solvents for sulfur dioxide in a cyclic method involving regeneration by heating is discussed. Because of the vapor pressure of ammonia over sulfite-bisulfite solutions during regeneration, there is an optimum concentration of the ammonia in the solution which produces the maximum capacity and requires the minimum quantity of steam for regeneration. This concentration is a function of the composition of the raw gas and of other operating conditions. For dilute gases with high humidity, the optimum concentration may be less than half the concentration of the saturated salt solution. The optimum concentration of ammonia decreases as the absorption temperature and/or regeneration temperature decreases,

increases as the sulfur dioxide concentration of the gas increases, and increases as the efficiency of the scrubber increases the saturation of the solution. (Author abstract modified)

7563 APTIC NUMBER 21973

Johnstone, H. F. and D. B. Keyes
RECOVERY OF SULFUR DIOXIDE FROM WASTE GASES. Ind. Eng. Chem., 27(6):659-665, June 1935. 4 refs. (Presented at the American Chemical Society Symposium on Distillation, Cambridge, Mass., Dec. 28-29, 1934.)

A method is described for calculating the number of theoretical plates, or the value of the diffusional potential, in the regeneration of a solution of ammonium sulfite-bisulfite saturated with respect to a dilute sulfur dioxide gas. While the sulfur dioxide is less volatile than the water, its relative concentration in the vapor may be increased by the stripping action of the vapor countercurrent to the solution, provided no reflux is returned to the top of the column. The size of the regenerator and quantity of steam required is estimated for a number of feed concentrations for the two cases of distillation (1) by direct steam and (2) by the indirect application of heat to the solution. The steam required for a single-effect nonrecompression regenerator varies from 4 to 16 pounds per pound of sulfur dioxide recovered, depending on the composition of the dilute waste gases and on other conditions of operation. The results obtained on a 12 by 81 inch column packed with 1-inch Raschig rings are discussed. (Author abstract modified)

7564 APTIC NUMBER 21984

Johnstone, H. F., H. J. Read, and H. C. Blankmeyer
RECOVERY OF SULFUR DIOXIDE FROM WASTE GAS. Ind. Eng. Chem., 30(1):101-109, Jan. 1938. 15 refs. (Presented at the American Chemical Society Meeting, 94th, Rochester, N. Y., Sept. 6-10, 1937.)

The partial vapor pressures were measured at 35, 50, 70 and 90 C over a long range of concentrations and compositions of sulfite-bisulfite solutions of sodium and methylamine. Suitable interpolation formulas are given to represent the vapor pressures as a function of temperature and solution composition. Sufficient data for a number of other sulfite-bisulfite solutions are reported to show the effect of the nature of the solution on the temperature coefficient of the vapor pressure of sulfur dioxide. Theoretical considerations show that the solutions having the greatest capacity for absorbing sulfur dioxide from dilute gases in a cyclic process and requiring the smallest amount of steam for regeneration are those containing sulfites of bases with an ionization constant of 10 to the minus 8th power and solutions of salts of weak acids saturated with the free acid. (Author abstract modified)

7565 APTIC NUMBER 21985

Johnstone, H. F. and A. D. Singh
RECOVERY OF SULFUR DIOXIDE FROM WASTE GASES. Ind. Eng. Chem., 32(8):1037-1049, Aug. 1940. 27 refs. (Presented at the American Chemical Society Meeting, 99th, Cincinnati, Ohio.)

A new process for the regeneration of sulfite-bisulfite solutions used for absorbing sulfur dioxide from waste gases is described. It is based on the precipitation of zinc sulfite, followed by decomposition of the dried solid in a flash calciner to give pure sulfur dioxide and zinc oxide, the latter being recycled. A thorough study in the laboratory and pilot plant has given important information on several of the unit operations. A discussion of the design of flash calciners based on the transfer of heat to particles suspended in gas streams is included. Data are presented on the rate of oxidation of sulfite-bisulfite solutions in the recovery process from actual plant operation, and a new flow sheet for desulfation is described. (Author abstract)

7566 APTIC NUMBER 21987

Johnstone, H. F. and R. V. Kleinschmidt
THE ABSORPTION OF GASES IN WET CYCLONE SCRUBBERS. Trans. Am. Inst. Chem. Engrs., vol. 34:181-198, 1938. 18 refs. (Presented at the American Institute of Chemical Engineers, 30th Semi-Annual Meeting, White Sulphur Springs, May 9, 10, 11, 1938.)

The performance of two wet cyclone dust washers as gas absorbers was studied by measuring the rate of absorption of sulfur dioxide from dilute gases when the circulated water was treated with soda ash to maintain the pH between 5.5 and 8.0. The quantity of gas treated varied between 25,000 and 55,000 cu ft per minute at 500 F and contained approximately 0.05% sulfur dioxide. The percentage removal in one washer receiving 100 gallons of the solution per minute was better than 95%, while that of the other, which received 50 gallons per minute, was about 85%. The average absorption coefficients were, respectively, 4.05 and 1.58 lb moles/(hr) (cu ft) (atm). A theory of absorption by a spray droplet is developed which agrees closely with experimental data. When applied to cyclone scrubbers, the calculated value for the coefficient agrees sufficiently well to justify using the theory for general design purposes. (Author abstract modified)

7567 APTIC NUMBER 19013

Jonke, A. A., E. L. Carls, R. L. Jarry, H. Haas, W. A. Murphy, and C. B. Schoffstoll
REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION. (ANNUAL REPORT). Argonne National Lab., Ill., Chemical Engineering Div., 62p., 1969. 23 refs.
CFSTI: ANL/ES-CEN-1001

Fluidized-bed combustion of fossil fuels, to which particulate limestone is added to react with sulfur oxides, is being studied as a means of reducing emission of the sulfur dioxide released during combustion. Results of a literature survey

and supporting investigations conducted on a variety of proposed additives indicated that limestones is the most favorable for reaction with SO2. An empirical model was developed to relate laboratory-obtained kinetic data on the reaction rates of limestone and SO2 to the fluidized-bed operating parameters of bed height, superficial gas velocity, and additive particle size. Results of bench-scale experiments using a 6-in. -dia fluidized-bed combustor operated at a superficial gas velocity of 3 ft/sec are presented also. Emission of SO2 was reduced to 29-87% of the initial SO2 concentration, depending on the type, particle size, and quantity of limestone added. In these experiments, the maximum degree of CaO utilization was 38%. Data are presented on the combustion efficiency of the fluidized-bed system, the extent of limestone calcination during combustion, the solids elutriation rates, and the distribution of particle size of elutriated solids. Nitrogen oxide concentrations in the flue gas during fluidized-bed combustion, the sources of nitrogen, and the reduction in NO concentration observed when limestone was added to the fluidized bed are also discussed. (Author abstract)

7568 APTIC NUMBER 19936

Joyce, Ronald S.
TWO-BED EVAPORATIVE LOSS CONTROL DEVICE. (Calgon Corp., Pittsburgh, Pa.) U. S. Pat. 3,515,107. 3p., June 2, 1970. 2 refs. (Appl. May 31, 1968, 5 claims).

A device which desorbs adsorbed hydrocarbons from an evaporative loss control device and feeds them back into the engine for combustion without causing an undesirable change in the fuel mixture is described. The device employs two activated carbon adsorbing beds. A conventional one is installed below the air cleaner. The second, and generally smaller one, is positioned in the system so that it is not exposed to hydrocarbon vapors in the hot soak period, while exit vapors from the main bed are passed through it during the purge cycle. Previous systems, which utilize only one bed, cause an over-rich air/fuel mixture during the initial portion of the purge cycle, resulting in stumbling, generally poor performance, and high carbon monoxide release.

7569 APTIC NUMBER 21952

Kaiser, Elmer R.
EVALUATION OF THE MELT-ZIT HIGH-TEMPERATURE INCINERATOR. (OPERATION TEST REPORT). Public Health Service, Cincinnati, Ohio, Bureau of Solid Waste Management, City of Brockton Grant DO1-UI-00076, 113p.., Aug. 1968. 13 refs.
CFSTI: PB 187309

The performance of a high-temperature incinerator was tested in terms of its potential for practical application. The incinerator is unique in that it is basically a vertical, cylindrical shaft furnace with a refractory lining. The non-combustible fractions of refuse are melted in a bed of high-temperature coke, and drained from the furnace as molten slag and iron. Organic matter in the residue is thereby automatically prevented and complete sterility is achieved. The residue has a high density. In the state of development and method of operation at the time of testing, the pilot incinerator did not perform satisfactorily or reliably. The process has sufficient promise to warrant further design and development. The technical advantages of the incinerator are a residue free of putrescible matter, maximum density of landfill, and the elimination of ground water or stream pollution from deposit of incinerator residue. The emission control system was not operative during the test in order to permit stack gas sampling. Gaseous emissions were comparable to those of well designed conventional incinerators. Particulate emission averaged approximately 13 lbs/1000 lb gas. No odor was detectable.

7570 APTIC NUMBER 19581

Kamino, Yasumi, Shigenori Onizawa, Kenji Yasuda, Masaaki Miyaji, Yoshihide Kawamura, and Akira Inoue
REMOVAL OF SO2 IN EXHAUST GAS BY THE STEAM-GENERATED ACTIVATED CHARCOAL PROCESS (I). REPEATED ABSORPTION-DESORPTION EXPERIMENT AND ECONOMIC EVALUATION OF THE PLANT. Hitachi Shipbuilding Co. (Japan), p. 1420, 1969 (?). Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 2p., Oct. 30, 1969.

In bench-scale tests of the steam-generated activated charcoal process, the removal rate of sulfur dioxide was observed with and without air treatment. The air treatment, which comes between the desorption and absorption states, consists of passing air containing water at 100-200 C through the absorption-desorption tower for one hr, followed by dry air for 30 min. The treatment enabled the charcoal to absorb 90% of the sulfur dioxide even after repeated use. The apparatus and operating conditions required for application of the activated charcoal process to a 250,000 kWH power plant are noted.

7571 APTIC NUMBER 19301

Kanioka, Yutaka
CHARACTERISTICS OF THE VENTURI SCRUBBER. (Benchuri sukuraba no tokusei). Text in Japanese. Funtai Kogaku Kenkyu Daishi (J. Res. Assoc. Powder Technol., Japan), 7(2):69-75, Feb. 1, 1970. 21 refs.

The advantages and disadvantages of a venturi scrubber are reviewed. The design of the scrubber can be modified according to properties of the particulates and the types of gas to be cleaned. High collection efficiency can be achieved for ultra fine particles. The temperature and humidity of the gas to be processed do not effect the efficiency of the scrubber. Structure is simple, construction cost low, and the axial direction can be chosen horizontal, vertical, or oblique. By the use of corrosion-resistant material, a venturi apparatus can be applied to corrosive mist or gas. Because of an extremely large interfacial coefficient of the cleaning water droplets, it can be applied to the revocery of gases, adsorption, cooling, humidifying, or the recovery of heat. Since the nozzle size is several mm in diameter, jamming of the nozzle does not occur even without a filter. Since the cleaning water is sprayed and mistified by the gas flow, no high-pressure pump is required. Operation and maintenance are simple and inexpensive. A venturi

scrubber cannot be applied if the collection of particulates in a dry state is required. Pressure is relatively large and a large amount of cleaning water is needed. The scrubber has a large potential as an air pollution countermeasure, but several improvements are needed.

7572 APTIC NUMBER 19484

Karpati, Judit and Gyoergy Mathe
DUST CONTROL EXPERIMENTS WITH SAND PREPARATION PLANTS IN STEEL FOUNDIRES. (Acelontodei homokelokeszito portalanitasaval szerzett tapasztalatok). Text in Hungarian. Ontode, 100(10):226-231, Oct. 1967. 4 refs.

A study was made of the design and operation of dust-collecting equipment in sand preparation plants serving steel foundries. The belt system transporting the sand from the screens takes the prepared sand to a storage bin. Envelopes were employed at points where used or fresh sand gives off dust, and the dust was first aspirated from these and the aspirated air purified in a wet cyclone before release. By way of ascertaining the efficiency of the equipment, dust exposure was studied at various places of work, with and without the use of the aspirator, before and after the beginning of work, using a konimeter for dust measurements.

7573 APTIC NUMBER 21802

Kato, Yujiro
PLANS AND OPERATIONAL EXAMPLES ON FILTER TYPE DUST COLLECTOR SYSTEM AT VARIOUS INDUSTRIES (V) - THE ROLE OF BAG FILTERS IN THE CERAMIC INDUSTRY (II). (Gyoshubetsu ni miru rokashiki shujin sochi no keikaku to unten jisshirei (V) - yogyo ni okeru baggu firuta (sono II). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(8):521-525, Aug. 15, 1968.

The operational conditions of bag filters used for controlling emissions in the ceramic industry are illustrated by several examples. In the electrode manufacturing industry, grinding, classification, conveying, gathering, calcination, and finishing are possible emission sources. The bag-house used for controlling emission from finishing is taken as an example. In the firebrick manufacturing plant, the mills commonly used for milling the raw materials are the main sources of dust. High efficient bag filters and hoods are necessary for controlling the emissions, the major ingredients of which are sand, soda ash, and limestone. Also discussed is the baghouse equipped for controlling emissions from a mixer for lead-glass manufacture. The application of bag filters for a perlite manufacturing plant is typified by the baghouse used for controlling emissions from kiln exhaust. Perlite dust is quite light in weight (specific gravity: 0.02), creating a new dust problem when it is disposed from the hopper. One of the devices provided to prevent the problem is the Double Flap. Other industries mentioned in the article are asbestos manufacturing, carbon-black manufacturing, and limestone manufacturing. The physical properties of dust varies considerably with temperature, humidity, ingredients, handling methods, etc. The baghouses must be designed with these properties in mind.

7574 APTIC NUMBER 19591

Kawazoe, Kunitaro
REMOVAL OF SO2 FROM FLUE GASES. (Nenshohaigasu no datsuryu process ni tsuite). Text in Japanese. Seisan Kenkyu (Ind. Production Res.), 20(2):17-21, Feb. 1968. 13 refs.

Most of the sulfur dioxide emitted into the atmosphere in Japan results from the combustion of crude oil imported from the Middle East as well as from the vast quantities of sulfur imported at the rate of two million tons a year. To recover sulfur from waste gases as a useful resource is also an important facet of air pollution control. Various processes leading to the elimination of sulfur dioxide from combustion exhaust are described according to wet and the dry methods. The former approach includes wet absorption, absorption by ammonia water or by milk of lime. Dry-type operations include the Reinluft process, the wet scrubber activated charcoal method, and the manganese dioxide method. In addition, the speed of adsorption of sulfur dioxide on activated charcoal is investigated. The adsorption rate of the gas alone physical adsorption, as well as the mixture with other gases at various temperatures is plotted (chemical reaction), for comparison. The factors that promote adsorption accompanying chemical reaction are considered to be: the speed of diffusion of sulfur dioxide at the surface film on the charcoal particles, the diffusion rate of sulfur dioxide within the particles, the rate of physical adsorption, and the oxidation rate of adsorbed sulfur dioxide. A brief mathematical discussion is given on the adsorption rate and its general trend over time, using data on the activated charcoal added to ferric hydroxide as a model. The discussion includes the case when there is sulfur dioxide alone and when there are other gases such as oxygen and water vapor present. Not only is it essential to eliminate sulfur dioxide from the atmosphere, but it is also important to avoid the production of other substances that enter the atmosphere together with the exhaust gas.

7575 APTIC NUMBER 19262

Keller, Emil
IMMERSION STRUCTURE CONSISTING OF PLATES FOR A MECHANICAL-BIOLOGICAL SEWAGE TREATMENT PLANT. (Aus Platten bestehender Tauchkoerper in einer mechanisch-biologischen Klaeranlage). Text in German. (Emil Keller, Rischofszell, West Germany) Swiss Pat. 476,685. 5p., Aug. 15, 1969. (Appl. July 25, 1968, 13 claims).

An immersion structure consisting of plates was devised for a mechanical-biological sewage treatment plant. The plates have a surface enlarging structure created by corrugation. In addition, the surface of the plates is rough for better adherence of the substrate. The plates are preferably of a synthetic material such as polyvinylchloride. They are vertically arranged with horizontal corrugations and are spaced 15 to 25 mm apart. The profile of the corrugation is of trapezoidal shape. The immersion structure runs in guide rails so that it can be dipped into the sewage and removed again. It is hoisted by ropes which

are fastened to a shaft. An electric motor drives the shaft. The motor is equipped with a ventilator which, besides cooling the motor, produces an air convection in the sewage treatment tank.

7576 APTIC NUMBER 19468

Keller, James I.
REMOVAL OF SULFUR DIOXIDE FROM GASES CONTAINING THE SAME. (Union Oil Co. of California, Los Angeles) U. S. Pat. 2,729,543. 8p., Jan. 3, 1956. 14 refs. (Appl. Dec. 12, 1950, 11 claims.)

Modifications are provided for the process of absorbing sulfur dioxide from a gas stream in an aqueous solution of a buffering agent capable of maintaining a pH value of 4-6 and regenerating the rich absorbent by treatment with gaseous hydrogen sulfide. The improvements consist of greatly increasing the rate of the regeneration reaction by (1) increasing the concentration of thiosulfate ion in the absorbent to a value above that of the inherent concentration, or (2) carrying out the regeneration at an elevated temperature below the boiling point of the absorbent, or both (1) and (2), and withdrawing the regenerated absorbent out of contact with free H2S substantially as soon as the stoichiometric amount of free H2S has dissolved in the absorbent. Thus, maintenance and corrosion problems of the original process are obviated by carrying out the regeneration step under such conditions that the H2S is consumed by reaction with the rich absorbent as soon as it is dissolved, and by removing the regenerated absorbent from the regeneration zone as soon as the quantity of H2S required for stoichiometrically complete regeneration has dissolved in the absorbent.

7577 APTIC NUMBER 17320

Kempner, Stanley K., E. N. Seiler, and Donald H. Bowman
PERFORMANCE OF COMMERCIALLY AVAILABLE EQUIPMENT IN SCRUBBING HYDROGEN CHLORIDE GAS. J. Air Pollution Control Assoc., 20(3): 139-143, March 1970.

Six commercial fume scrubbers were tested for their ability to remove hydrogen chloride gas from plating room exhaust air. The scrubbers, which represent different types of equipment available for this application, were chosen on the basis of their specified ability to remove 90% of the contaminant from a 2500 scfm gas stream consisting of ambient air with 20 mg/cu m of HCl gas. The units were connected to ductwork and piping simulating actual producting conditions. The contaminant was carefully metered into an accurately measured air stream drawn through the scrubber. A continuous sample of the scrubber discharge was recorded by a conductivity meter. The results are presented in a series of curves plotting efficiency vs water rate. Efficiencies of close to 100% were obtained with a vertical packed scrubber and extended surface scrubber. A horizontal packed scrubber and a plate scrubber attained efficiencies of better that 95%. A fan type scrubber was entirely unacceptable and is not recommended for use with a gaseous contaminant. The tests also revealed that optimum efficiencies can be obtained at water rates much lower than those recommended by the manufacturers. This makes it practical to use nonrecirculated water in production scrubbers. Variations in scrubber design and effectiveness of mist eliminators are also discussed. (Author abstract modified)

7578 APTIC NUMBER 19619

Ketov, A. N., V. V. Larikov, V. V. Pechkovskiy, and A. S. Shligerskiy
DRY LIME METHOD OF REMOVING SULFUR DIOXIDE FROM POWER STATION FLUE GASES. (Sukhoy izvestkovyy sposob ochistki topochnykh gazov tets ot sernistogo angidrida). Text in Russian. Zh. Prikl. Khim., 41(4):724-729, 1968. 3 refs.

It was demonstrated experimentally that a 50-60 % removal of sulfur dioxide from flue gases can be achieved by stoichiometric addition of dry lime to the furnace charge when burning coal at 1100-1200 C. An excess air factor of 1.15 and a lime consumption at 10-20% above the stoichiometric value are recommended for this method (lime analysis (%): CaCO3, 83.8; MgCO3, 1.7; CaSO4, 0.8; P2O3, 0.5; SiO2 plus insoluble ash, 13.2).

7579 APTIC NUMBER 19527

Khan, A. R., P. J. Anderson, and H. F. Fakin
CAVERN STORAGE OF LIQUEFIED NATURAL GAS. Proc. World Petrol. Congr., 7th, 1967, 6(21):323-332. 11 refs.

Mined cavern storage for liquefied natural gas (LNG) has been under active development for many years in several countries. Described are the efficient mining techniques that renewed U. S. interest in caverns as a storage system by making them economically competitive with conventional storage methods. Laboratory data are reported on the physical and thermal behavior of selected rocks at low temperature. The design, construction, and operation of an insulated test cavern are described. The effects of insulation on evaporation rates and thermally induced rock stresses are discussed. Information on the design and cost of commercial caverns for LNG storage is presented based on the results from this pilot test. A completed pilot cavern awaits filling with LNG for completion of the test program. The successful proof of this concept will provide the industry with yet another competitive method of storage. With the prospect of increasing LNG shipments from gas-rich countries to markets in Europe and Japan, space requirements in crowded areas may dictate the necessity for belowground cavern storage. Also, if large volumes of gas are required for peakshaving with distribution from a centrally located facility, cavern storage of LNG can be an economical solution. (Author abstract modified)

7580 APTIC NUMBER 19194

Kimura, Norio and Koichi Iinoya
INITIAL COLLECTION EFFICIENCY OF DRY CLOTH FILTER. (Kanshiki rofu firuta no shoki hoshukoritsu nitsuite). Text in Japanese. Funtai Kogaku Kenkyu Daishi (J. Res. Assoc. Powder Technol.,

Japan), 7(2):124-130, April 1, 1970. 9 refs.

The collection mechanism of aerosol particles at the initial period of cloth filtration was experimentally determined. A monodispersed aerosol was produced by a LaMer type apparatus having an evaporation and reheating chamber where the temperature was automatically controlled. A dry cloth filter sample was fixed by a rubber packing to a 80 mm id flange. A constant flow of air was maintained. Aerosol density in the upper and lower stream of the filter was monitored by a permeability meter of the light scattering type, measured as an electrical current. The monodispersion property and mean diameter of particles was optically monitored by a 'HOTS' apparatus, the so-called Owl. Experimental results obtained are presented as a correlation between the initial collection efficiency of an isolated thread and a modified inertial parameter. If the particle size is much smaller than the opening size of a woven cloth, the collection mechanism of the particles is almost due to the inertial impaction. In a short-fiber cloth filter, because of the feather-like fibers in the texture, some particulates are collected at a low speed region. With the increase a flow rate, however, collection of particles by inertial impaction becomes predominant, as is the case with a long-fiber cloth filter. The collection efficiency does not depend on the structure and material of a filter cloth.

7581 APTIC NUMBER 19281

Kiyoura, Raisaku
METHOD OF TREATING EXHAUST GASES CONTAINING SULFUR DIOXIDE.
(Mitsui Toatsu Chemicals Inc., Tokyo (Japan)) U. S. Pat. 3,508,868. 4p., April 28, 1970. 5 refs. (Appl. March 4, 1966, 13 claims).

A method for removing the sulfur dioxide contained in flue gases is described. The wet processes to remove SO2 have defects in that they are expensive, the temperature of the washed gas is reduced, and the gas contains smoggy substances and, therefore, is not well diffused. In the dry processes, the equipment is corroded by sulfuric acid, the operation is complicated, and the absorbent and adsorbent are expensive. According to this method, an exhaust gas containing SO2 is oxidized to sulfur trioxide which is then reacted with ammonia to form ammonium sulfate crystals. The gas is contacted with a vanadium pentoxide catalyst at a temperature of 340-410 C and at a space velocity of 1000 to 8000 to convert the SO2 to SO3. Ammonia gas can be added to the high temperature gas containing SO3, or the gas can be cooled to a temperature above its dew point and then the ammonia can be added. In either case, the gas reaction temperature of the SO3, ammonia and water vapor should be between 100 and 250 C to prevent the formation of ammonium sulfite. The gas containing ammonium sulfate crystals is recycled back into the reaction chamber so that the crystals become nuclei for producing ammonium sulfate and thus accelerate the growth of the crystals. The crystals are separated from the gas by passing it through any gas-solid separator, such as a cyclone, a filter, or a high voltage electrostatic precipitator.

7582 APTIC NUMBER 19918

Klein, H.
INFLUENCE OF FLOW PATTERN ON THE DUST REMOVAL EFFICIENCY OF MECHANICAL SEPARATORS. (Einfluesse der Stroemung auf die Abscheideleistung mechanischer Entstauber). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:333-344, 1970. 13 refs.

Mechanical systems of dust removal from waste gases offer special advantages over bag filters and wet processes. Of the various types of mechanical separators, those relying upon the action of centrifugal force are most common. Basic to the improvement of such devices is a better understanding of the flow patterns that govern the separation process, which are here summarized and analyzed. Some types of separator use a diverted channel flow (less than 180 deg deflection) while others make use of a reverse flow (180 deg) or a combination thereof. With the introduction of turbulence, the flow patterns become increasingly more complex. Among the phenomena analyzed are the vortex and the sink. The theoretical and mathematical analyses are applied to a study of the cyclone separator.

7583 APTIC NUMBER 19482

Klimecek, R.
A CZECHOSLOVAKIAN PROPOSAL OF AMMONIACAL FLUE GAS DESULPHURIZING FOR A 100 MW POWER PLANT. Ann. Genie Chim., 1967:175-179. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.)

The amounts of flue gases from high-capacity thermal power plants in Czechoslovakia are of the order of millions cu m/hr. The bicyclical ammonia scrubbing method proposed to treat these high quantities is described. After prior cooling to 25 C and dust extraction, the smoke is washed in two stages by an aqueous ammonium sulfite-bisulfite solution and is then returned to the atmosphere with a residual SO2 and ammonium content of less than 0.01% by volume. The SO2 enriched washing liquid undergoes thermal regeneration by steam. After elimination of part of the SO2 by desorption, and elimination of the (NH4)2SO4 by crystallization at 35 deg, the liquid is recycled. The SO2 freed during the thermal regeneration is cooled, dried, and liquefied for compression. The method is designed for an industrial unit with a power of 100 MW. Since investment and operating costs are expected to be high, successful utilization of the method will depend on finding markets for the ammonium sulfate and liquid SO2. (Author abstract modified)

7584 APTIC NUMBER 19487

Knapp, Lester L. and Clayton C. Cook
TREATMENT OF GASES EVOLVED IN THE PRODUCTION OF ALUMINUM.
(Aluminum Co. of America, Pittsburgh, Pa.) U. S. Pat. 3,503,184. 3p., March 3, 1970. 5 refs. (Appl. March 7, 1968, 5 claims).

A process for removing hydrogen fluoride and finely divided solids from gas evolved in the electrolytic production of aluminum entails passing the gas stream upward for 0.25 to 1.5 sec through a 2- to 12-in. bed of finely divided alumina particles. The hydrogen

fluoride is sorbed by the alumina particles and the finely divided solids are entrapped in the fluidized bed, which contains 50 to 150 pounds of alumina per pound of hydrogen fluoride. The alumina particles containing hydrogen fluoride are removed from the bed and fed to the fluoride baths of electrolytic cells. The gas stream leaving the bed is passed through bag filters on the surfaces of which any remaining finely divided solids and alumina particles small enough to be carried upward are deposited. The average residence time of alumina particles in the bed is 2 to 14 hrs.

7585 APTIC NUMBER 19829

Knoblauch, K. and H. Juentgen
MINING RESEARCH: DRY PROCESS FOR DESULFURIZATION OF WASTE GASES CONTAINING DUST. (Das Bergbau-Forschung -- Verfahren zur trockenen Entschwefelung staubhaltiger Abgase). Text in German. VDI (Ver. Deut. Ingr.), no. 149:116-121, 1970. 5 refs.

A special technique has been developed, based on the principle that sulfur dioxide in the presence of oxygen and water vapor is absorbed at temperatures above 100 C by a special activated coke and is converted into sulfuric acid. The coke absorbs the acid and can be regenerated by heating in an inert atmosphere, which causes sulfur dioxide gas to be given off. The coke may also be washed with water, yielding a dilute sulfuric acid. The process was tested for a year and a half in two experimental plants with a coal-fired experimental boiler house. With variation in the SO2 concentration between 800 and 2500 ppm, the desulfurization amounted to 65-95%. Coke consumption in the thermal regeneration process was 0.1 kg of coke per kg of SO2 recovered, while with the washing regeneration method there was a loss of 0.04 kg for a desulfurization of 80%. The SO2 recovered from thermal regeneration had a concentration of 45-30% vol. Sulfuric acid recovery from the washing process was 2-6% wt in a washing reactor and 13-18% wt in a circulating system of wash water. Under laboratory conditions it is possible to raise the acid concentration to 25% wt. The wash water recovery system also permits simultaneous dust removal. On the basis of the testing, plants have been made for the construction of a larger pilot plant with a throughput of 100,000 cu Nm/hr.

7586 APTIC NUMBER 19054

Kolganov, V. A. and L. V. Padushkevich
EXPERIMENTAL STUDY OF COPRECIPITATION OF SOLID AEROSOL PARTICLES ON THE FIBERS OF A MODEL FILTER. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 29(4):380-386, 1967. 4 refs.

Filtration of a monodisperse stearic acid aerosol through a model filter consisting of uniform fibers 16 micron in diameter was investigated. Experiments were conducted for 118 hours at low concentrations. The breakthrough coefficient of the filter decreases steadily, while the resistance remains constant for the first 30 hours and then increases substantially. The capture cross section during coprecipitation was calculated from the results, and was found to decrease slowly with time. The value calculated from the experimental data was close to the theoretical value calculated earlier. (Author conclusions modified)

7587 APTIC NUMBER 19298

Konno, Akira and Jiro Watanabe
LAND USE PLANNING FOR PUBLIC NUISANCE CONTROL. (Kogaitaisaku notameno tochiriyo keikaku). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 8(2):78-84, 1969. 5 refs.

In the past, measures to control pollution have generally been adopted only after the appearance of visible, large-scale pollution. Recent means, however, tend to be preventive in nature. Land-use planning for pollution control, for example, represents an approach that is more concerned with prevention than with remedies. In addition to its conventional meaning, the term now implies concern for the future prospect of cities and the controlled development of urban land. The point is that land-use planning is directed not only to the utilization of all available control technology but also to the allocation of still underveloped land. Examples are presented of the ways in which land-use planning participates in controlling each major category of pollution. In the field of air pollution, land-use planning provides available land for the construction of plants with adequate stack heights and also land for the centralization of air conditioning facilities. For noise abatement, recommendations are made for a buffer zone 50-100 meters from a factory. To protect water resources, land planning provides for adequate drainage and sewage systems.

7588 APTIC NUMBER 19819

Konno, Keiichi
BASIC PROBLEMS IN CHOOSING AIR FILTERS. (Eafiruta no sentaku ni okeru kisoteki mondai). Text in Japanese. Kukichowa To Reito (Air Conditioning Refrig.), 9(1):44-47, Jan. 1969.

Air conditioning and air cleaning devices have to be installed in such a way that neither would interfere with the proper function of the other. The important factors for evaluating the air filters are the loss of wind pressure, the rate of dust collection, and the allowable quantity of accumulated dust that determines the length of use. Proper maintenance is necessary to prevent clogging of pores, for example. Air filters (unit or automatic types) can be classified according to whether mechanical or electrical forces are the basis of dust collection. The characteristics of some air cleaners are presented for dry, wet, or adhesive types, and the efficiency of dust capture according to the degree of pressure loss is tabulated. The designer of a building has to base his decisions on the allowable size and concentration of dust particles and the necessary amount of ventilation. The loss of wind pressure can be calculated from the total resistance of the ventilation system and the capacity of the fan, and knowing the pressure loss, appropriate filters can be chosen. The mathematical formula for computing the dust collection rate of a filter is presented.

7589 APTIC NUMBER 19189

Kotb, A. K.
ADSORPTION OF SULPHUR DIOXIDE ON COAL. J. Appl. Chem. (London), vol. 20:147-152, May 1970. 6 refs.

A study was made of the feasibility of using coal as an adsorbent material for the removal of sulfur dioxide from stack gases emitted to the atmosphere by different industries. From preliminary results, it would appear that coal is to be favored by a raw materials/cost-effectiveness ratio of 2:1. The work shows semi-quantitatively that the adsorptive capacity of sulfur dioxide on coal varies slightly from one coal to another, and that when coal is re-used through numerous (approximately 40) cycles, its effectiveness as an adsorbent for sulfur dioxide is not greatly reduced. Moreover, this research supports the view that the heating value, ash, sulfur content, etc. of most types of coal changes only slightly after repeated usage as an adsorbent. If, as these findings indicate, coal can initially be used as a sulfur dioxide adsorbent prior to its use as a fuel, economic potential for commercial applications should be enhanced. Empirical equations, developed to correlate the adsorption-desorption characteristics of different coals, can be used as a basis for prediction and comparison by future investigators to further explore this research. (Author abstract)

7590 APTIC NUMBER 19628

Kuz'minykh, I. N., D. M. Popov, and P. I. Gorbachev
BUBBLE ABSORPTION OF SULFUR DIOXIDE YIELDING A CONCENTRATED SOLUTION OF AMMONIUM BISULFITE. (Barbotazhnaya absorbtsiya dvuokisi sery s polucheniyem krepkogo rastvora bisul'fita ammoniya). Text in Russian. Khim. Prom. (Moscow), no. 2: 128-132, 1960. 7 refs.

An experimental sieve-plate bubbler was used to study absorption of sulfur dioxide with simultaneous production of standard ammonium bisfulfite solution. The column was operated in two sections: one 9-plate section maintained standard ammonium bisulfite concentration (SO2-NH3 concentration ratio, 0.65), and one 8-plate section assured compliance with SO2 emission standards. Adequate SO2 removal was achieved with an initial concentration of 6.5%; absorber resistance was 450 mm H2O.

7591 APTIC NUMBER 19642

Land, George W., Eino W. Linna, and William T. Farley
CONTROLLING SULFUR DIOXIDE EMISSIONS FROM COAL BURNING BY THE USE OF ADDITIVES. Preprint, Air Pollution Control Association, New York City, 33p., 1969. 4 refs. (Presented at the Air Pollution Control Association Annual Meeting, 62nd, New York, June 1969, Paper 69-143).

A project is reported in which 20 tests with five coal additives dolomite chips and pulverized dolomite, hydrated lime, aragonite (a high-calcium limestone), red mud (an aluminum by-product high in iron oxide), and a proprietary liquid combustion catalyst - were run in an operating industrial boiler plant to study their effects on sulfur dioxide emissions. The test unit was a 750-HP Wickes boiler fired by a multiple-retort underfeed stoker. Two methods were used: the additive was either mixed with the coal before it was fired, or was injected with compressed air jets over the fire. Sampling techniques for suspended particulates, using a gravimetric sampling train, and for SO2 in the stack gases, are described. Results are presented and discussed; in general they were anomalous, and because the tests were limited in scope and subject to numerous uncontrolled variables, no conclusions are drawn. The results do however, indicate that SO2 emissions from coal burning can be significantly reduced by the use of certain additives, and that further studies are warranted.

7592 APTIC NUMBER 19035

Lang, H. W., A. J. Sippel, III, and P. W. Freedman
EFFECT OF CETANE IMPROVERS IN THE FUEL ON NITROGEN OXIDES CONCENTRATION IN DIESEL EXHAUST GAS. Bureau of Mines, Washington, D. C., Dept. of Investigations 7310, 5p., Oct. 1969. 4 refs.
CFSTI: PB 188557

Amyl nitrite and amyl nitrate in concentrations up to 2% in normal diesel fuel caused an increase of nitrogen oxides in the exhaust of a four-cycle, single-cylinder-type diesel engine at low fuel-air ratios. After the engine had reached steady-state operation at each compression ratio to be tested, one gas sample was collected for chromatographic analysis and three samples for nitrogen oxide determination. Colorimetry by the phenoldisulfonic acid method was used for determination of nitrogen oxides. Maximum concentration of oxides was observed at a fuel-air ratio of about 0.035 with normal fuel. At this fuel-air ratio, or higher, the additives caused a decrease in oxide concentration. Effects were similar at 16:1 and 20:1 compression ratios. No significant effects on normal exhaust products (carbon dioxide, carbon monoxide, methane, or oxygen) were caused by these additives. (Author conclusions modified)

7593 APTIC NUMBER 19290

Lang, Ludwig
APPARATUS FOR DECONTAMINATION OF EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. (Arno Fitterer and Sohn, Baden-Baden (W. Germany)) U. S. Pat. 3,503,714. 7p., March 31, 1970. 10 refs. (Appl. Sept. 6, 1966, 7 claims).

A device for the decontamination of engine exhaust gases is described. In known devices, difficulties have been encountered when using catalysts. They have involved activating the catalyst, maintaining the necessary operating temperature, and preventing overheating in the catalyst zone. The present device uses two chambers separated by a venturi tube. The first chamber contains an afterburner or catalyst body; the second chamber contains a catalyst in a permeable housing with an internal flow channel. A fresh air feed can be arranged in the venturi tube

between the two chambers. An excess of fresh air is introduced, forming a regulating means for the operating temperature. With the advantageous flow of exhaust gas, the temperature of the exhaust gas-air mixture is adjusted so that it does not rise above the normal reaction temperature in the catalyst area. Carbon monoxide and unburned hydrocarbons are removed from the exhaust gas by catalytic oxidation. The device is also provided with a bypass system. In the lower speed range of up to 60 km/h, the catalyst is fully activated, but it is inoperative at high speeds.

7594 APTIC NUMBER 21879

Lang, Ludwig
DEVICE FOR EXHAUST DECONTAMINATION OF COMBUSTION ENGINES. (Vorrichtung zum Entgiften von Abgasen, insbesondere aus Verbrennungsmotoren). Text in German. (Arno Fitterer and Sohn, Baden-Baden, (W. Germany)) Swiss Pat. 455,396. 8p. April 30, 1968. (Appl. Sept. 6, 1966, 7 claims).

A device for decontamination of exhausts from combustion engines was devised which comprises catalytic oxidation and if necessary preliminary afterburning of the exhausts. The apparatus consists of a ceramic body holding two chambers. In the first chamber the exhaust gas is intensely mixed. The second chamber holds the catalyst which is enclosed in a hexagonal perforated metal casing closed by a solid lid in front and by a perforated lid at the end. A central duct pierces the two lids of the catalyst casing, while the catalyst material on Raschig rings fills the space between the central duct and the perforated casing. Fresh air is mixed with the exhaust gas on its way to the mixing chamber. The whirling of the exhaust gas in connection with the cross-sectional change in the mixing chamber has a noise muting affect. The highest catalytic oxidation takes place at low speed or standstill, while at higher speed a large fraction of the exhaust bypasses the catalyst since thorough combustion is not required here.

7595 APTIC NUMBER 21873

Langhoff, J.
REDUCTION OF EMISSIONS THROUGH LOW SMOKING FUELS OBTAINED BY VARIOUS PROCESSES. (Emissionsverminderung bei den nach verschiedenen Verfahren hergestellten raucharmen Brennstoffen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:323-330, 1970. 5 refs.

Several processes which eliminate the smoke producing ingredient in fuels are outlined. The Inichar fluidized bed process is based on selective oxidation of pitch. Anthracite passes through a 50 cm thick layer of suspended turbulent sand. Residence time is 90 min, while the operating temperature is 300 to 350 C. Low-smoking briquettes are obtained. In another process, anthracite is preheated to 100 C and mixed with 10% of a 50% ammonium lye. The water is evaporated subsequently to a residual concentration of 3%. Bituminous anthracite passes through a reactor together with sand (1:7 ratio) which has been heated to 700 C in a third method. The intense contact of the briquettes with the sand prevents caking, and within 50 min the mixture has passed the coking plant. The waste gas contains 800 g/cu Nm of tar. In a fourth method, pulverized coal and water agglomerate to form pellets through an imparted rotary movement. The pellets are then treated as in process three. In the last process described, coal is carbonized at 800 C and mixed in a hot state with cold bituminous coal so that a temperature of 450 C is obtained. The product is a low-smoking fuel which can be used for central heating. Oxidation in a fluidized bed involves the lowest capital investment costs and has the lowest substance loss. The NH4 briquetting process is the most expensive one. Generally it can be said that the above refining processes will increase the normal costs by 10 to 15%.

7596 APTIC NUMBER 19219

Larson, Robert W.
COLLECTOR AND METHOD OF MAKING THE SAME. (Assignee not given.) U. S. Pat. 3,507,301. 6p., April 21, 1970. 9 refs. (Appl. April 21, 1966, 4 claims).

An exhaust collector, and a combination of header pipes with the collector, through which internal combustion engine exhaust gases flow smoothly with very little turbulence are described, together with the method of construction. A major difficulty with existing collectors is that a completely smooth flow of gas is not obtained, due to obstructions, irregularities, or openings in the flow path which cause turbulence. This problem is overcome by the present system. Depending on the type of header pipe to which it is to be joined, the collector may have 2, 3, or 4 lobes. The collector is made by rolling a piece of flat sheet metal into a generally conical tube, fusing the seam of the tube, and creasing the tube to provide semitubular lobes.

7597 APTIC NUMBER 19609

Lavilleon, Patrick De
WORLDS FIRST COMMERCIAL LIQUEFIED NATURAL GAS OPERATION NEARS COMPLETION. World Petrol., vol. 35:40-45, Sept. 1964. 2 refs.

Several important events in the liquefied methane industry are reported. The world's first commercial methane liquefaction plant of its type, at Arzew, Algeria, is described. The economics and technology of the plant are reviewed. The storage method is of the underground frozen earth type, supplemented by three double-walled tanks. The world's first movement by ocean-going tankers of liquefied natural gas on a large commercial scale is described. Design criteria of the ships and tanks, and problems encountered during construction are discussed. Docking arrangements for the cryogenic tankers and distribution of the delivered gas are described.

7598 APTIC NUMBER 21884

Lehrer, Anton
PACKED FILTERS FOR DUST SEPARATION. (Schuettschichtfilter zur Staubabscheidung). Text in German. (Intensiv-Filter GmbH,

Langenberg (Germany)) Swiss Pat. 450,877. 4p., Jan. 31, 1968. (Appl. Jan. 26, 1967, 4 claims).

A dust separator was devised which consists of several levels of packed layers housed in a cylindrical casing with a conical lower outlet section. The packed layer on each level is divided into several sectors which are moved by a ring shaped structure. On each level there is one filter cleaning device, and on the same side as the cleaning device is a dust outlet. There is only one service entrance per level. All sectors, with the exception of the one which is being cleaned, receive the same quantity of dirty gas at the same time. The filter is mechanically and pneumatically cleaned.

7599 APTIC NUMBER 21877

Lehrer, Anton
ROUND BAG FILTER FOR DUST SEPARATION. (Rundfilter zur Staubabscheidung). Text in German. (Intensiv-Filter GmbH, Langenberg (Germany)) Swiss Pat. 450,878. 6p. Jan. 31, 1968. (Appl. Jan 19, 1967, 6 claims).

A round bag filter is described which is divided into several sectors holding tubular or envelope-type bags. The sectors are sealed off toward the center by a rotatable cylindrical structure which moves the sectors successively to a shaking device and a filter cleaning air inlet at the top of the casing. Underneath the filter cleaning devices is a dust outlet funnel terminating in the conical lower section of the filter at or close to the main outlet of the filter. A service opening in the cleaning section provides access to the interior of the filter. The bags are suspended on iron bars which rest on springs. The filter has the advantage that the cleaning operation of the bags is confined to one area in the filter.

7600 APTIC NUMBER 19308

Leibovich, R. E., A. I. Rublik, V. P. Shelest, and S. K. Shelkov
HIGH-TEMPERATURE DESULPHURIZATION OF COKE. Coke Chem. (USSR) (English translation from Russian of: Koks i Khim.), no. 11:17-18, 1969. 9 refs.

Sulfur reduction data are presented for individual grades and blends of Donbas coal carbonized in a Tamman furnace and heated in intervals from 1000 C to 1700 C. The figures show a steady reduction in residual sulfur content of individual coals and blends, the most rapid reduction occurring from 1400-1500 C. The coal which lost the highest proportion of its original sulfur content during carbonization was the grade containing the highest percentage (35.84) of volatile matter.

7601 APTIC NUMBER 19588

Leigh, James Harrison
IMPROVEMENTS RELATING TO THE TREATMENT OF BOILER FLUE GASES. Simon-Carves Ltd., Stockport (England)) British Pat. 525,883. 1p., Sept. 6, 1940. (Appl. Jan. 12, 1940, 1 claim).

A process for removing sulfur compounds from boiler flue gases and converting them into a salable product is described. The gases are washed with an ammoniacal liquor which is then heated under pressure in an autoclave. Sulfur compounds are converted into ammonium sulfate which is crystallized by evaporation and recovered. The temperature in the autoclave is about 190 C and the pressure should not exceed 200 lbs/sq in. This process is economical and does not involve high pressures in the autoclave. No preliminary treatment is needed to ensure a low temperature and pressure to produce the desired reaction.

7602 APTIC NUMBER 19411

Lepsoe, Robert and Robert Fraser Mitchell
PROCESS FOR THE PRODUCTION OF AMMONIUM SULPHATE AND ELEMENTAL SULPHUR. (Consolidated Mining and Smelting Co. of Canada, Ltd., Montreal (Quebec) U. S. Pat. 2,359,319. 6p., Oct. 3, 1944. (Appl. Oct. 2, 1941, 7 claims).

Ammonium sulfate and elemental sulfur are produced by the continuous autooxidation, or conversion, of a solution in which ammonium bisulfite is the main constituent. The reaction proceeds continuously at a uniform and rapid rate when the ammonium bisulfite solution, which may contain ammonium monosulfite, is fed, in the presence of either or both of the compounds ammonium thiosulfate and an ammonium polythionate, into an ammonium sulfate solution containing free sulfuric acid. The temperature of the reaction is maintained above the melting point of sulfur, between 120 and 140 C under superatmospheric pressure. The heat generated by the autooxidation reaction is available for use within the process. The process permits economies in capital and operating costs.

7603 APTIC NUMBER 19556

Lepsoe, Robert
PROCESS FOR THE REDUCTION OF SULPHUR DIOXIDE TO ELEMENTAL SULPHUR BY MEANS OF CARBON. (Consolidated Mining and Smelting Co. of Canada, Ltd., Montreal (Quebec)) U. S. Pat. 2,102,081. 6p., Dec. 14, 1937. (Appl. Jan. 14, 1936, 9 claims).

A process for reducing sulphur dioxide to elemental sulphur by means of carbon is described. The process involves introducing SO2 into a reducing fluid bed, such as coke, at a high initial temperature which permits the substantially instantaneous establishment of the reducing reactions and then, by effecting a positive control over the temperature of the reactions, to maintain them within a temperature range which will bring them to completion within a minimum of time, thus permitting the operation of the furnace at its highest capacity by avoiding the progressively higher temperatures which would normally result. Advantages of this process include greatly increasing the furnace capacity, eliminating trouble due to hot zones, and improving heat capacity.

7604 APTIC NUMBER 19428

Lewis, Gilbert N. and William A. Lacey
THE EQUILIBRIUM BETWEEN CARBON OXYSULFIDE, CARBON MONOXIDE AND SULFUR. J. Am. Chem. Soc., vol. 37:1976-1983, 1915. 6 refs.

The free energy of the reaction of carbon monoxide and sulfur was investigated as an aspect of the reduction of sulfur dioxide to sulfur by carbon monoxide. When CO and S are heated together at 250 to 300 C, carbon oxysulfide, carbon dioxide, carbon disulfide, and carbon monosulfide are formed by the reactions: (1) CO plus S yields COS; (2) 2COS yields CO2 plus CS2; and (3) CS2 yields CS plus S. Using a specially designed glass bomb apparatus, the equilibrium in the first reaction was determined at 302 deg. (K equals 201) and less reliably at 260 deg (K533 equals 435). In these experiments, the equilibrium showed a shift in favor of CO with diminishing temperature. Approximate values were obtained for the equilibrium constants of the other two reactions. Reaction (2) appeared to be much more rapid than reaction (1) at the experimental temperatures. (Author summary modified)

7605 APTIC NUMBER 19632

Lincoln, Bert H.
METHOD AND APPARATUS FOR CONVERTING HYDROGEN SULPHIDE INTO SULPHUR. (Continental Oil Co., Ponca City, Okla.) U. S. Pat. 1,901,249. 3p., March 14, 1933. 1 ref. (Appl. July 25, 1932, 4 claims).

Hydrogen sulfide occurs in a number of processes in large quantities, such as the treatment of certain high sulfur content petroleum oils. It is difficult to dispose of H2S in large quantities due to its poisonous character and noxious odor. A method of converting hydrogen sulfide into sulfur in a safe and economical manner is described. A volume of H2S is split into two streams. One is burned to form sulfur dioxide which is contacted with water in a spray tower to form sulfurous acid. The other stream of H2S is contacted with the sulfurous acid to form elemental sulfur and water by an oxidation-reduction reaction. The sulfur may be dehydrated, melted, and molded into blocks, or it may be recovered in a finely divided state. The equipment used in this process is also described.

7606 APTIC NUMBER 19586

Lindblad, Axel Rudolf
IMPROVEMENTS IN THE PRODUCTION OF SULPHUR. (Assignee not given.) British Pat. 428,979. 3p., May 22, 1935. (Appl. June 12, 1934, 14 claims).

A process for reducing sulfur dioxide to obtain elemental sulfur is described. It is possible to directly reduce the SO2-containing gas coming from a furnace, but this leads to a contaminated sulfur product. To produce pure sulfur, the furnace gas is cooled before being passed through an electrostatic precipitator. By cooling, the purification is more effective because the impurities are condensed and precipitated. The gas must be cooled to below 200 C before entering the precipitator, and on leaving the temperature must not exceed 150 C. The gas is then reheated to at least 200 C before being contacted with the reducing agent. It is suggested that the reduction reaction be conducted in the presence of an alkali metal catalyst. It is best to conduct the reaction in such a way that some reducing gases are formed, such as carbon monoxide, carbon oxysulfide, and carbon disulfide. If the gaseous mixture is contacted with the catalyst, these reducing gases will react with any remaining SO2, producing additional sulfur. The temperature in the reduction furnace for the first reducing treatment should be maintained at 800-1100 C. The latter treatment, when the reducing gases are used for further reduction, can take place at a lower temperature.

7607 APTIC NUMBER 19589

Lindblad, Axel Rudolf
METHOD FOR THE RECOVERY OF SULPHUR BY MEANS OF REDUCTION OF SULPHUR DIOXIDE. (Assignee not given.) British Pat. 426,850. 1p., April 10, 1935. (Appl. June 13, 1934, 5 claims).

A method is described for producing sulfur from sulfur dioxide-containing gases obtained from the roasting of pyrites, copper pyrites, arsenical pyrites, or other sulfurous ores. The SO2 is reduced by carbon monoxide in the presence of a catalyst which is rich in alumina. The catalyst may be obtained by smelting bauxite or other substances rich in alumina with lime or lime-containing materials. Since the catalytic effect is dependent on the alumina content, this should be at least 25% aluminum oxide. With this catalyst, the preferred temperature range is between 400 and 650 C. A further improvement can be obtained by mixing the oxides or hydroxides of iron or manganese with the catalyst.

7608 APTIC NUMBER 19420

Lindblad, Axel Rudolf and Fritz Olov Hernerydt
METHOD OF PRODUCING ELEMENTAL SULPHUR BY REACTION BETWEEN SULPHURETED HYDROGEN AND SULPHUR DIOXIDE. Imperial Chemical Industries Ltd., London (England) and Bolidens Gruvaktiebolag, Stockholm (Sweden) U. S. Pat. 2,200,928. 2p., May 14, 1940. (Appl. Dec. 15, 1938, 2 claims).

Elemental sulfur is produced by contacting a mixture of hydrogen sulfide and sulfur dioxide with a catalytic substance capable of absorbing water at the reaction temperature, e.g., Portland cement, smeltcement, and gypsum. In addition, the catalytic effect can be raised to a very high degree by adding or admixing sulfurous pyrites or pyrites concentrate. Contact between the gaseous mixture and the catalyst should take place at a temperature range of 120-400 C, or, more specifically, 200-300 C.

7609 APTIC NUMBER 19581

Lindblad, Axel Rudolf
PROCESS FOR PRODUCING SULPHUR BY REDUCING SULPHUR DIOXIDE. (Assignee not given.) British Pat. 426,456. 4p., April 3, 1935. (Appl. June 12, 1934, 9 claims).

A process for producing elemental sulfur by reducing the sulfur dioxide contained in furnace gases is described. A gaseous mixture containing SO2 and oxygen is fed into a gas producer containing coal or coke. The speed of the gas and the temperature in the producer are regulated so that the gases formed consist mainly of carbon monoxide. This gaseous mixture is then contacted with SO2. The coal or coke in the producer is maintained in continuous movement by a rotary grate. This causes friction of the charge pieces against one another so that the ash formed is continuously removed and fresh surfaces are always available for reaction with the SO2. The gas mixture from the producer and the SO2 are passed through a catalyst-filled chamber. A suitable catalyst is brick coated with an iron compound or an alkali metal compound. If any impurities are contained in the gas, it is recommended that they first be purified by cooling so that the impurities are condensed and then passing them through an electrostatic precipitator.

7610 APTIC NUMBER 19626

Lindblad, Axel Rudolf
PROCESS FOR PRODUCING SULPHUR BY MEANS OF REDUCTION OF SULPHUR DIOXIDE. (Assignee not given.) Brit. Pat. 426,165. 4p., March 28, 1935. (Appl. June 13, 1934, 11 claims).

A method of producing elemental sulfur by reducing sulfur dioxide is described. The SO2 is reduced by a gaseous reducing agent, such as producer gas or blast furnace gas, in a reaction chamber. The chamber is designed so that the SO2-containing gases are introduced countercurrently in relation to the gases passing out of the chamber and produced by the reduction reaction. In this way, the SO2-containing gases are preheated by the hot reduction gases. The central part of the reaction chamber is filled with brick coated with a mixture of iron and alkali compounds. To maintain a uniform temperature throughout the reaction chamber, the SO2-containing gases are introduced in the lower part and reducing agent is introduced at the upper part of the chamber. The reaction products are removed at the lower part of the chamber.

7611 APTIC NUMBER 19178

Loehner, K.
TECHNICAL MEANS FOR REDUCING UNDESIRED EMISSION COMPONENTS AT CONVENTIONAL DRIVES. (Technische Moeglichkeiten zur Verminderung unerwuenschter Emissionskomponenten bei konventionellen Antriebsarten). Text in German. VDI (Ver. Deut. Ingr.) Ber., no 149:57-67, 1970.

Lower fuel to air ratio in todays vehicles causes an increase of carbon monoxide and hydrocarbon emissions. The nitric oxide emission, however, is highest with excess air operation. In diesel engines with direct injection, 3000 ppm NO are emitted at full load operation. The CO emissions, too, reach these values at full load operation. At partial load operations, they are far below the NO emissions. The hydrocarbon emission is low at full load operation, but may become quite annoying during longer idling. All cylinders of multi-cylinder engines must receive the same fuel to air ratio. Various carburetor installations (e.g., air control nozzle, conical needle, diameter air funnel, adjustable air funnel, etc.) help to achieve this. A hot spot in the intake duct for evaporation of the fuel thrown to the wall is of help. Proper spark timing (delay of ignition) helps to reduce emissions during idling of the Otto engine. Opening the throttle valve avoids higher emissions of CO, HC, and NO when the engine acts as brake. Through preheating the fuel/air mixture, fuel is evaporated and a uniform mixture is supplied to all cylinders. This permits the use of fuel/air ratios of 1.05 to 1.15 which helps to reduce CO emissions in city driving to 0.3%. The HC emissions are also reduced. Large cylinders and compact combustion chambers with a small surface reduce HC emissions. Considerable reduction of NO emissions can be achieved through decreasing the combustion temperature by adding up to 20% cooled inert exhaust gases containing CO2, H2O, and NO. Delayed ignition reduces the NO emission but simultaneously reduces the power.

7612 APTIC NUMBER 21878

Loftheim, Tor Bjorn
APPARATUS FOR SEPARATING DUST AND OTHER FOREIGN BODIES FROM THE AIR AND FROM OTHER GASES. (Apparat zur Abscheiden von Staub und andern Fremdkoerpern aus Luft und andern Gasen). Text in German. (Assignee not given.) Swiss Patent 450,127. 2p., Jan 15, 1968. (Appl. Nov. 25, 1966, 3 claims).

The apparatus consists of a cyclone-type blower with several blades extending from a central hub, each blade of which has an extension of its running edge which is in tangential contact with a cone that operates coaxially with the blower fan. This creates a calm zone between the various blades so that the larger dust particles have the opportunity to fall into a pocket, from which they can be removed by the centrifugal force created by the blower. The use of this apparatus makes possible an improved dust removal efficiency, amounting to 95-97%, especially with high respect to microparticles.

7613 APTIC NUMBER 21893

Lowicki, Norbert, Gernot Hanig, and Klaus Husmann
THE - WASTE GAS - SULFUR - PROCESS. REPORT ON THE DEVELOPMENT OF A PROCESS FOR THE REMOVAL OF SULFUR FROM FLUE GASES. Grillo-Werke A. G., Duisburg-Hamborn (West Germany), Oct. 1969. Translated from German. Relov and Associates, Denver, Colo., 68p., March 30, 1970.

The difficulty of the removal of sulfur from waste gases varies according to the origin of the waste gas. Waste gases of steam boiler plants precipitate rather uniformly with respect to quantity, temperature, and composition. On the other hand, sinter waste gases contain additional metal oxide smoke which can complicate

the process of sulfur removal. Thus, the process selected should have no sensitivity to disturbing gas components and should have versatility with respect to the absorption of any of the sulfur compounds coming under consideration. A desulfurization process was developed which is an absorption process with thermal regeneration of the charge absorbent. The process principle selected is based on the reaction of oxide compounds between a basic and an amphoteric heavy metal component. The presence of a compound $Mg_6Mn_2O_8$ has been proven using X-ray structure investigation; the presence of a compound $Mg_3Mn_2O_5$ is also probable. In this combustion, the basic component is used as the actual absorbent and the heavy metal component as the oxygen donor. This has the effect of increasing the total activity of the mixture. For the same reason, the absorption of hydrogen sulfide from waste gas is also made possible. In the thermal regeneration of the charge mass, both components protect each other reciprocally against deactivation. Economic aspects were a primary consideration in the selection of the desired components for the absorption mass. This eliminated elements like Cr, V, Mo, and Zn. Though Ca and Mg were practical, Fe and Mn were selected because of the rapid formation and stability of the oxide compounds between them as well as the inactivity during absorption. All chemical and process-technological predictions made on the basis of laboratory experiments were confirm. For oil-fired steam boiler plants, flue gas desulfurization plants ready for practical use can be set up and operated. Capital outlays and operational costs are given for an oil-fired 300 MW power plant, in addition to total annual operational costs. A particular advantage of this process is that the charge mass can be regenerated by various desulfurization systems at a central location.

7614 APTIC NUMBER 19616

Ludwig, Gerhard
ENERGY IN THE CHEMICAL AND PETROLEUM PROCESSING INDUSTRY. MORE RECENT RESULTS IN THE FIELD OF COAL TREATMENT. (Energie in der chemischen und erdoelverarbeitender Industrie. Neuere Ergebnisse auf dem Gebiet der Kohlerveredlung). Text in German. Brennstoff-Chem. (Essen), 50(1):T1-4, Jan. 1969.

A review of three papers presented at the meeting of the Hard Coal Mining Association in Essen between Oct. 29 and 30, 1968 is given. The first paper dealt with mining and coke production; the second, with methods for reducing the sulfur content in coal; and the third, with specific details of coking plants (type of coke ovens, etc.). In the past few years, the average sulfur content in the coal mined in the Ruhr Valley amounted to 1.12%. The fraction of organically bound sulfur amounted to 40%, and 60% of the total sulfur content is bound to iron. There are wet and dry coal desulfurization methods. Of the various wet methods, floatation was best suited for removal of the pyrite grains with less than 0.5 mm diameter. The wet-operating vibrating screen was best suited for pyrite between 0.06 and 3 mm and the settling tank for material above 1 mm. The dry methods are not as efficient as the wet methods, but they are used in West Germany because 40% of the hard coal ready for use is dry. With a magnetic separator with a field strength of 18,000 gauss, the sulfur content in the grain size class of 1 to 0.1 mm could be reduced from 2.8 to 1.6%. This was accompanied by a carbon loss of 14.9%. With laundering, the sulfur content could be reduced, in favorable cases, to 33.7% and in unfavorable cases to 76.2% of the intial content.

7615 APTIC NUMBER 21819

Ludwig, John H.
AIR POLLUTION CONTROL TECHNOLOGY: RESEARCH AND DEVELOPMENT ON NEW AND IMPROVED SYSTEMS. Law Contemp. Probl., Spring 1968:217-226. 15 refs.

In the area of pollution control from stationary sources, major research and development is now concentrated on the control of sulfur oxides. In the future there will be expanded programs for other pollutants, especially nitrogen oxides. Major emphasis on control of emissions from motor vehicles is now focused on reduction of carbon monoxide and hydrocarbons. Future efforts will focus on control of nitrogen oxides and particulates and on unconventional vehicles with low pollution potential, such as electric-powered and steam-powered cars. Instruments and techniques are now available for measuring many pollutants, especially inorganic gases, but there is a need for automated, smaller-sized instruments both for stationary sampling stations and for airborne sampling of the atmosphere. There is also a need for remote-type monitors capable of measuring stack emissions at a distance. In the area of meteorology, a number of urban diffusion models and an air pollution potential forecast program are now operational; improved models and quantitative forecasting methods are under development. (Author conclusion)

7616 APTIC NUMBER 19928

Lyben, Raymond G.
CATALYTIC MUFFLER. (Ethyl Corp., New York) U. S. Pat. 3,511,617. 8p., May 12, 1970. 13 refs. (Appl. June 9, 1967, 15 claims).

A catalytic muffler designed to reduce contaminants in the exhaust gas of internal combustion engines is described. It consists of a closed container with a series of louvers extending into the gas flow stream. Louvers direct the gas into the catalytic substance, then direct it out the exit of the muffler. A problem with previous catalytic mufflers is that the gas was expected to pass directly through the catalytic agent, rather than allowing it to circulate around it. Oftentimes, the catalyst ages and crumbles, making it difficult for gas to pass through it. The muffler described eliminates this problem, since there is always a clear free path through the exhaust conduit. The muffler is suitable for catalyzing the oxidation of unburned hydrocarbons and carbon monoxide, functioning to remove particulate matter as well.

7617 APTIC NUMBER 19257

Maeda, Isamu and Mohuo Ito
AN APPARATUS FOR THE CONTINUOUS RECOVERY OF SULFUR OXIDES IN FLUE GAS. (Haigasu chuno iowankabutsu renzoku kaishusochi). Text in

Japanese. (Sumitomo Machine Industries, Osaka (Japan)) Japanese Pat. Sho 45-2644. 2p., Jan. 29, 1970. (Appl. April 28, 1967, claims not given).

An improved conventional method of recovering sulfur oxides from flue gas is presented which can be applied to flue gas from boilers, smelting or metal-sintering processes, or pulp manufacturing. Since the sulfur oxides concentration in flue gas is extresely low and volume of flue-gas to be processed is extremely high, the gas was previously passed through absorbents from which the sulfur oxides were recovered. The process required rinsing with inert gas, H2, CO, water, or alkaline solutions. Consequently, generators and circulators for those gases and liquids were necessary. In the present process, however, the major part of the flue gas is cooled to the temperature appropriate for adsorption and subsequently led to a continuous adsorption apparatus, where the sulfur oxides are adsorbed. The remainder of the gas by-passes the cooling chamber. After the removal of the remaining oxygen, the gas is led to a de-adsorption chamber and sulfur oxides are recovered. The system requires no inert-gas generators or gas heaters. Moreover, since a moving-layer adsorption system is empolyed, less adsorbent is needed. Also, the concentration of the recovered gas is more uniform than that covered by previous processes.

7618 APTIC NUMBER 19561

Maier, Charles G.
METHOD OF REDUCING SULPHUR COMPOUNDS TO ELEMENTARY SULPHUR OR HYDROGEN SULPHIDE. (Assignee not given.) U. S. Pat. 1,941,702. 1p., Jan. 2, 1934. 2 refs. (Appl. Feb. 7, 1931, 4 claims).

A method of reducing sulfur compounds to elemental sulfur or hydrogen sulfide is described. When used in combination with a catalyst such as calcium sulfide or bauxite a mixture of hydrogen and carbon monoxide in the ratio of 2:1 is more effective than other reducing agent. Gases containing 14-17% SO2 are reacted with CO and hydrogen at 850 C, reducing the SO2 to elemental sulfur. In another form, roasted zinc sulfide, which contains some residual zinc sulfate, is treated with a mixture of CO and hydrogen at 450-800 C. The sulfur is reduced to elemental sulfur and hydrogen sulfide which are vaporized.

7619 APTIC NUMBER 19515

Mallatt, R. C., J. F. Grutsch, and H. F. Simons
AMOCO LAUNCHES TWO-PRONGED ATTACK ON POLLUTION. Oil Gas J., 68(26):100, 102, 104, 109, 110, 112, and 114, June 29, 1970. (Presented at the American Petroleum Institute Division of Refining Meeting, Houston, Tex., May 13-15.)

Pilot-plant work has shown that two novel treatment sequences will provide essentially complete removal of contaminants from a refinery process water effluent. Both processes involve use of a 'Bio-Flotation' process as a conditioning step. Water effluent from an oil-water separator is passed through a series of aerated compartments where biological oxidation, additional sedimentation, and occluded oil occur. Because concentrations of nonflocculated biological growths are lower, oxidation rates are higher than those reported for the activated-sludge process. Flotation is followed by chemical coagulation of suspended matter and other undesirable substances; alum or ferric sulfate are used as the primary coagulation, together with small amounts of an organic polymer to toughen the floc. Coagulation is followed by phase separation, either by the air-flotation process or mixed-media filtration. The second innovation is a fluidized bed incinerator for disposing of oily sludge, spent caustic, and similar wastes. The fluidized bed is formed of sand and heated to 900 F, after which the oily sludge, and then spent caustic, is introduced. Solids remain in the bed, while gaseous combustion products and water vapor are discharged through a gas-cleaning system.

7620 APTIC NUMBER 19524

Manier, G.
A NEW METHOD FOR DETERMINING MINIMUM STACK HEIGHT. (Eine neue Methode zur Bestimmung von Schornsteinmindesthoehen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:157-162, 1970. 4 refs.

Improvements in the calculation of minimum stack height are made possible by the use of frequency distributions of meteorological dispersion data as a replacement for the use of average values, long criticized but not previously superseded by a better system. The procedure was developed in two stages: calculation of the maximum concentration for all possible combinations of emission data and dispersion factors; determination of the incidence of various dispersion factors and of regional peculiarities. The two types of findings are combined in a graph, from which the appropriate chimney height can be read.

7621 APTIC NUMBER 19332

Marks, Alvin M.
METHOD AND APPARATUS FOR SUPPRESSING FUMES WITH CHARGED AEROSOLS. (Assignee not given.) U. S. Pat. 3,503,704. 4p., March 31, 1970. 7 refs. (Appl. Oct. 3, 1966, 9 claims).

Noxious fumes contained in automobile engine exhaust or gas-borne industrial and residential waste are treated by passing them through a conduit containing a charged aerosol of some suitable liquid, e.g., water, and an array of fluid-dispersing capillary tubes. The charged aerosol is preferably simultaneously formed and charged by a charging electrode, whereupon the fume particles are entrained by the charged aerosol droplets. The charged aerosol particles and droplets are then neutralized and coalesce to form larger droplets by the normal process of coagulation within unchanged aerosols. The large droplets and their entrained pollutants can then be collected or washed away. The invention may be used to detoxify chemical wastes by mixing well-known reactants with the liquid of the aerosol. Fumes containing sulfuric acid, for example, are rendered harmless by reaction with sodium hydroxide dissolved in the charged droplets.

7622 APTIC NUMBER 19462

Marsh, John David Francis and William Barry Savile Newling
IMPROVEMENTS IN OR RELATING TO THE RECOVERY OF SULPHUR FROM GASES CONTAINING HYDROGEN SULPHIDE. (Gas Council, London (England)) Brit. Pat. 769,995. 8p., March 13, 1957. (Appl. Dec. 2, 1953, 13 claims).

A process modification is described wherein at least 96% conversion to sulfur is obtained from gases with a minimum hydrogen sulfide content of 50% by the method of quench cooling, in which gas from the outlet of the sulfur condenser is recirculated to those zones where the exothermic reaction tends to raise the temperature too much. Thus, a continuous process is provided requiring a single reactor, a single sulfur condenser, and no waste heat boiler or any source of external heat but producing the same high yields as processes with more complex equipment requirements. The H2S-bearing gas is burned in a combustion chamber in the presence of a controlled amount of air; the resulting gas mixture is partially cooled and passed through a single catalytic converter to convert H2S and SO2 to sulfur which is then condensed. The reactor contains two or more layers of catalyst between which substantially sulfur-free process gas from the outlet of the sulfur condenser is recycled to control the temperature of the gas leaving the reactor at a level not more than 20 C above the sulfur dewpoint. Sulfur-free process gas is also recycled for addition to the gases leaving the combustion chamber to partially cool the combustion gases and further lower the dewpoint for sulfur at the reactor outlet.

7623 APTIC NUMBER 19812

Martens, Herrann
DETERMINATION OF THE SPECIFIC SORPTION EFFICIENCY (ACTIVITY) OF GAS PURIFYING MASSES BY DIFFERENTIAL THERMAL ANALYSIS (DTA). (Bestimmung der spezifischen Sorptionsleistung (Aktovitaet) von Gasreinigungsmassen mit Hilfe der Differential-Thermoanalyse (DTA)). Text in German. Erdoel Kohle (Hamburg), 23(5):289-294, May 1970. 10 refs.

With the aid of differential thermal analysis, the activity of unused and hydrogen sulfide-laden gas purifying masses in dry desulfurization processes was determined. The temperature rise from the reaction of H2S or a mixture of H2S-O2-N2 is first measured. For determination of the water content, the sample was heated and the temperature increase was measured with the aid of a calibration device. Thus, the heat caused by the reaction was found. The specific sorption efficiency is then obtained via the reaction enthalpy of the sulfidization. In the case of sulfidization with just H2S, only the water content of the unused mass must be checked. However, when oxygen is present it is necessary to check the water content at the stationary desulfurization immediately after the temperature has steadied. Measurement of the activities of eight gas cleaning methods revealed that the Lux mass had the highest sorption efficiency, whereas bog iron ore had only about one fifth of the activity of the Lux mass.

7624 APTIC NUMBER 19454

Massey, P. S.
FROZEN EARTH PROPANE STORAGE. World Petrol., vol. 35:58-59, April 1964. (Presented at the Natural Gas Processors Association Annual Meeting, 43rd, New Orleans, La., March 1964.)

A frozen earth propane storage facility is described. Cost studies showed that for the storage conditions involved, frozen earth storage would be the most economical, given suitable soil ($4.75/bbl for the complete storage facility as compared with $5.50/bbl for aboveground refrigerated storage). Although frozen earth storage is generally less expensive than refrigerated above-ground storage, the difference is not large, and various factors inherent to each type of storage can actually reverse this trend. The facility consists of an unlined pit excavated at the earth's surface within an artificially frozen earthen ring, and covered with an insulated, steel, gas-tight roof. The completed size is 95 ft deep by 100 ft wide.

7625 APTIC NUMBER 19210

Matsuda, Norikazu
ABATEMENT OF AIR POLLUTION CAUSED BY FLUORIDE. (Fukkasuiso oyobi kakushu fukkabutsu niyoru taikiosen no taisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(7):509-514, July 15, 1970.

Sources of fluoride pollutants include aluminum refining and phosphate fertilizer, brick, glass, glass-fiber, steel, and cement manufacturing. Fluorides emissions from an aluminum refinery and a phosphate fertilizer plant, both subject to large numbers of damage claims, are shown in a block diagram. Examples of fluoride pollution by the Showa Denko plants in Fukushima and Chiba and Sumitomo Chemicals in Ehime are presented. Regulations applicable to pollutant sources in Osaka and Fukushima Prefectures are noted. A common method of processing fluorine compounds is the use of caustic soda. Fluorine becomes sodium fluoride, which is subsequently converted to calcium fluoride by lime. In aluminum refineries, the recovery rate of fluorine by the method is over 99%. Exhaust gas, however, shows a recovery rate of only 60-70%, even in factories equipped with a recovery device. If the density at the source is lowered to several ppm, the use of chimneys around 200-m high will reduce the ground concentration to .1 ppb. At present, the recovery of fluorides is accomplished by wet methods, which give rise to mists such as hydrofluoric acid. The efficient processing of the mist is a future problem. Since the demand for aluminum is predicted to be 2,000,000 tons in 1975, an increase in aluminum refineries is expected. In the process of construction, future refineries must be thoroughly evaluated for fluoride pollution.

7626 APTIC NUMBER 19607

Matsumoto, K. and Y. Shiraishi
MITSUBISHI CROSS FLOW SCRUBBER. Mitsubishi Heavy Industries,

Ltd., Tech. Rev., 4(5):1-6, Sept. 1967. 8 refs. Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 14p., Nov. 28, 1969.

A new type of cross-flow scrubber is described which utilizes a unique gas-liquid contact mechanism. The scrubber is designed to provide high-efficiency gas absorption and dust collection with a minimum pressure drop. The absorbing liquid flows down a multi-stair tray arrangement, dropping from level to level through overflow ports in each liquid receiver plate to form a liquid curtain across the gas-flow. In addition, the gas is directed at considerable velocity against the surface of the liquid that lies on the receiver plates. This combination of actions simultaneously entraps particulates in the liquid and exposes a maximum of liquid surface, both in the liquid screen and on the turbulated receiver-plate reservoirs, for efficient gas absorption. A method of calculating the required capacity for a scrubber of this type for a given gas flow is presented. Test data indicate efficiences of over 90% for gas absorption and 93-99% for dust collection, with pressure drops of 9-15 mm H2O per stair and 70-120 mm H2O for the assembly. Additional advantages claimed are reclaimability of the absorbing fluid and compact construction.

7627 APTIC NUMBER 19284

McConnaughey, Paul Willis
ARTICLE FOR THE DETERMINATION OF CARBON MONOXIDE. (Mine Safety Appliances Co., Inc., Pittsburgh, Pa.) U. S. Pat. 3,507,623. 3p., April 21, 1970. 4 refs. (Appl. Sept. 15, 1965, 4 claims).

A device for the colorimetric determination of carbon monoxide is described. It is more simple and less expensive than the conventional apparatus, and is suitable for use in the home and small businesses, such as checking for dangerous CO concentrations in automobile repair shops. A thin bed of colorimetric indicator responsive to CO is contained in the closed end of a transparent tube. The opposite end is closed from the atmosphere, but may be opened. A plug of gas permeable material is placed next to the indicator, and a second bed of indicator is situated between the plug and the opposite end. The second bed of indicator is protective and inhibits deterioration of the thin bed of colorimetric indicator used for determining the CO. In use, the tube is opened to the atmosphere and the second bed of indicator is discarded. Carbon monoxide diffuses through the plug, at a rate dependent on its concentration, and reacts with the thin bed of indicator to produce a color change. The color depends on the amount of CO that reacts with the indicator.

7628 APTIC NUMBER 19575

McIlroy, Robert A. and Henry P. Markant
GAS ABSORPTION APPARATUS. (Babcock and Wilcox Co., New York) U. S. Pat. 3,284,435. 4p., Nov. 8, 1966. 8 refs. (Appl. Nov. 19, 1965, 6 claims).

A compact series arrangement of gas absorption apparatus, designed to provide sequential stages of intimate contact between a gaseous and a liquid medium for heat or chemical exchange purposes, is described. The device consists of a plurality of venturi-shaped gas and liquid contact elements mounted to allow gas flow through them, with each contact element followed by provision for gas and liquid separation. The elements are mounted in a closed vessel provided with an inlet and outlet pipe. Previous arrangements occupy a large area and are expensive to install and operate. The device described is claimed to eliminate these problems. An example is provided for the absorption of sulfur dioxide contained in a gas stream by a liquid solvent containing magnesium hydroxide.

7629 APTIC NUMBER 19489

Medcalf, William A. and Lee Ashbrook
FILTER ARRANGEMENT. (American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,509,698. 6p., May 5, 1970. 16 refs. (Appl. May 1, 1967, 7 claims).

The efficient cleaning of permeable tubular filters by means of pulses of high-energy gas directed along a portion of the filter is described. This eliminates the need for complicated shaking arrangements or the use of high velocity jets of gas. Compressed air is introduced into the filter through gas nozzles and is directed to flow over a diffuser that is disposed in the tubular filter to define an annular opening between the outerperiphery of the diffuser and the inner periphery of the filter. Gas is passed along the inner surface of the filter as a generally hollow cylindrical wave, thereby expanding a portion of the filter. Accumulated particulate matter on the surface of the filter surface is removed by the movement of the filter resulting from the expansion, the particulates falling into a hopper.

7630 APTIC NUMBER 21981

Melhus, Joergen
IMPORTANCE OF EFFECTIVE AND ECONOMICAL PURIFICATION EQUIPMENT IF INDUSTRY IS TO MAKE FULL SCALE PROVISION FOR THE PURIFICATION OF ITS WASTE GAS EMISSIONS. (Effektivt oqekonomisk renseutstyr av stor betydning hvis industrien skal satse for fullt pa rensing av sine gassutslipp). Text in Norwegian. Tek. Ukeblad, (Oslo), 117(12):32-33, 46, March 19, 1970. 1 ref.

Choice of the proper type of dust separator (cyclone, scrubber, bag filter, electrofilter) depends on the properties of the dust particles to be separated: size distribution, specific weight, pollutant content of the waste gases, and electrical conductivity. Properties of electrofilters are discussed from the standpoint of electrical theory, filter efficiency, power supply, cleaning of the electrodes, and range of use in industry. The electrical resistance of the dust contained in waste gases should be in the range of 10 to the 8th power to 10 to the 11th power ohms per centimeter if the filter is to operate satisfactorily. Electrofilters find their industrial application in the purification of waste gases from cement plants, oxygen blast furnaces, sulfate-cellulose industries, and aluminum

furnaces. Electrofilters are costly to install but operate at low cost, require little maintenance, and have a low voltage drop. The efficiency is usually in the range of 95-98%.

7631 APTIC NUMBER 19376

Merriam, Henry P.
METHOD OF AND APPARATUS FOR CONDUCTING CATALYTIC REACTIONS. (General Chemical Co., New York) U. S. Pat. 2,090,217. 6p., Aug. 17, 1937. (Appl. July 23, 1932, 12 claims).

A process for the catalytic reduction of concentrated sulfur dioxide gas mixtures to elemental sulfur is described. When using concentrated SO2 mixtures, large quantities of heat are evolved in the reduction reaction, which lead to the formation of hydrogen sulfide. The temperature is controlled in this process by diluting the gas mixture with inert gases before reduction. This dilution of the SO2 causes a large increase in the volume of the gas mixture. The reaction of SO2 and the reducing agent, such as natural gas, may be effectively conducted by passing the gas stream through a number of suspended mounds of loosely associated, finely divided catalytic material, such as bauxite. The catalyst body in the converter includes several wide, unobstructed, circuitous gas passages so that efficient contact of the reacting gases and the catalyst is effected, and the flow resistance of the large gas volumes through the catalytic body is minimized. The gaseous reaction products are passed through a cooler or condenser to condense sulfur vapor and recover elemental sulfur. If the residual gases certain SO2 or H2S, they may be passed through a second catalytic body to recover additional sulfur. The design and operation of the converter are also included.

7632 APTIC NUMBER 19261

Moliskey, Anthony
TREATMENT OF PUMICE FOR USE IN FILTERING OUT OBNOXIOUS CONTENTS OF COMBUSTION GASES. (Donald V. Meis and Earl A. Waring, Newport, Wash.) U.S. Pat. 3,513,640. 4p., May 26, 1970. 2 refs. (Appl. Aug. 4, 1969, 3 claims).

The treatment of pumice stone for use in filtering combustion gases is described. The pumice particles are washed free of loose dust and water soluble materials by plain water and then dried. The cleaned particles are carried through a tank of a dilute water solution of paraldehyde or formaldehyde and citric acid. The preferred concentration is one part by volume paraldehyde or formaldehyde in 40,000-50,000 parts of water. To this solution is added one to five parts citric acid for each 10 parts paraldehyde or formaldehyde. In filtering the engine exhaust from a diesel engine, it is best to use pumice particles that have been treated with a solution using 4-5 parts citric acid for each 10 parts by volume paraldehyde or formaldehyde. For filtering the exhaust from a gasoline burning engine, the solution may contain only one part citric acid to 10 parts paraldehyde or formaldehyde by volume. Treated pumice particles can also be used for filtering furnace sacke stacks, mining shafts, and incinerators. The particles retain their ability to filter out obnoxious vapors and gases for several months with no apparent deterioration.

7633 APTIC NUMBER 19442

Morgan, D. T., F. P. Doyle, and S. S. Kitrilakis
ORGANIC RANKINE CYCLE WITH RECIPROCATING ENGINE. Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 23rd Annu., 1969, p. 156-159. 4 refs. (May 20-22.)

Advantages and characteristics of closed-cycle, Rankine-cycle power systems with reciprocating engines are discussed. While it is describes what is popularly known as a steam engine and much of the discussion applies to steam engines, the emphasis is on engines which are designed to use an organic working fluid in place of steam. Advantages common to both systems include quiet operation, multi-fuel capability, potential long life without maintenance, high torque at low speed, and extremely low pollutant emission. This last is a result of being able to accurately regulate the fuel/air mixture. Organic working fluids are proposed in lieu of steam because their tailorable lower working temperatures permit the design of less complicated engines. However, being organic, these fluids must be protected from thermal excursions or hot-spots. Once a hot-spot occurs, irreversible and catastrophic degradation of the fluid continues to occur. Similarly, oxygen can degrade the working fluid. For this reason, it is recommended that this type of power source have the working fluid degassed and the engine hermetically sealed after the fashion of air conditioner systems.

7634 APTIC NUMBER 19268

Muhlrad, W. and J. Remilleux
DEVELOPMENT OF ACID MISTS - CONVENTIONAL METHODS FOR THEIR PRECIPITATION - A NEW COLLECTION METHOD WITH TREATED FABRICS. (Die Entstehung von Saeurenebeln - Die bisherigen Abscheideverfahren- Ein neues Abscheideverfahren mit bespruehten Gewebe). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149: 367-376, 1970. 2 refs.

There are two types of mists, one of mechanical origin and one of chemical or thermal origin. Mists of mechanical origin develop through atomization of a liquid. The liquid can be atomized by force of its own pressure, by using compressed air along with the energy of the liquid, and by rapidly rotating turbines. These three methods of atomization yield droplets of a size not smaller than 5 to 10 micron. A fourth method of atomization is the venturi principle. Impingers, packed towers, and thimble filters are used for precipitating this kind of mist. These precipitators are space consuming. More recently, low pressure cyclones have come into use for this purpose. The second type of mist is produced by condensation in oversaturated gases. The droplets are smaller the higher the initial temperature and the more rapidly the gas is cooled. The size of the droplets of mists formed by chemical reaction are determined by the reaction speed. Most acid mists have only one polarity. For their precipitation, mostly electrostatic precipitators, high and low pressure venturi scrubbers, and thimble filters are

used. The latter device is quite efficient at low costs for mists which contain no solid particles. For submicroscopic mists, a new method has been developed based on spraying a filter of synthetic fiber with a liquid so that a liquid layer is formed. An illustration of a filter with tubular bags where the scrubbing liquid is injected above the upper end of the bag is given. At single layered fabric and a gas speed of 0.3 to 3 cm/sec can be used; with multiple layered fabrics, the speed may be between 2 and 10 cm/sec. The efficiency of this type of filter is as high as that of an electrostatic precipitator. The cost involved are much lower. These sprayed fabric filters will primarily be used for mists which contain solid particles.

7635 APTIC NUMBER 19199

Myers, Phillip S. and Otto A. Uyehara
METHOD AND APPARATUS FOR REDUCING EXHAUST EMISSIONS AND IMPROVING FUEL UTILIZATION IN INTERNAL COMBUSTION ENGINES. (Assignee not given.) U. S. Pat. 3,507,261. 13p., April 21, 1970. 9 refs. (Appl. June 20, 1969, 10 claims).

A device to reduce hydrocarbons, carbon monoxide, and oxides of nitrogen emitted from internal combustion engines is described. The device injects a stratified charge into the combustion chamber, thereby reducing contaminants and improving fuel utilization. The first constituent of the charge comprises exhaust gas, mixed with air if desired, and the second constituent is a fuel air mixture measurably richer or leaner than one which would produce maximum oxides of nitrogen. The relative amounts of the two constituents are varied in response to accelerator position by auxiliary exhaust and intake valves which are actuated by a variable timing control mechanism, with maximum fuel/air mixture and minimum exhaust gas/air mixture introduced for full engine load, and vice versa for minimum load. The amount of air mixed with the exhaust gas is determined by a valve mechanism controlled by engine temperature and accelerator position.

7636 APTIC NUMBER 19218

Nakajima, Shinichi
ACCIDENT PREVENTION AND COUNTERMEASURE FOR PUBLIC NUISANCE OF RECOVERY BOILER. (Kaishu boira no jiko boshi narabini koqai taisaku ni tsuite). Text in Japanese. Kami-Pa Gikyoshi (Journal of the Japanese Technical Association of the Pulp and Paper Industry), 24(7):351-355, July 1, 1970. Locomotive Manufacturing Co. (Japan).

The kraft pulp recovery boiler has more difficulties than the boiler using only heavy oil as fuel. Public nuisance is also one of the pressing problems of the day. The slight accidents that prevent continuous operation are due to corrosion of the superheated tube or leaking of the smelt. Corrosion can be avoided by using a suitable material for the wall of the tube and by maintaining a uniform wall temperature. The serious accidents accompanied by an explosion in the furnace occur through a smelting-water explosion or an explosion of the sub fuel. The former is avoided by preventing the black liquor from becoming thin and by preventing cooling water from flowing into the furnace. The latter is avoided by preventing the fire from going out. The development of a dust collector has solved the problems of smog, but offensive odor is still a problem. The principal components of the offensive odor are hydrogen sulfide and methyl mercaptan. They are emitted by the direct contact evaporator and the combustion room. Therefore, facilities without a direct contact evaporator must be established. There are two kinds of facilities without a direct contact evaporator; one has been developed in the U.S.A. and another in Scandinavia. The latter is considered to be more effective than the former. Even if the direct contact evaporator is not used, offensive odor is generated when combustion of black liquor is incomplete. The method developed by a corporation in Sweden was adopted.

7637 APTIC NUMBER 19241

Nakajima, Fumito
OXIDIZING CATALYZER OF EXHAUST GAS. (Haigasu no sanka shokubai). Text in Japanese. (Hitachi Manufacturing Co. (Japan)) Japanese Pat. Sho 45-3532. 4p., Feb. 5, 1970. (Appl. June 4, 1965, claims not given).

Two new catalysts, each having an active carrier with a large surface area, are proposed for engine exhausts. One is composed of 1-20 w/o cobalt oxide and 1-25 w/o vanadium pentoxide: the other of 1-20 w/o cobalt oxide, 1-25 w/o vanadium pentoxide, and 0.01-0.2 w/o platinum. The active carrier should have at least 80 sq m/g of surface area. Alumina, silica-alumina, silica-magnesia, and acid clay are appropriate as carrier materials. A carrier with a large surface area is obtained by forming a precipitate of gel in an aqueous solution and subsequently baking it. Cobalt or vanadium catalyst is obtained by baking either a simple substance or a compound. For this purpose cobalt chloride, cobalt nitrate, cobalt acetate, cobalt sulfate, cobalt carbonate, or cobalt oxalate is used in the form of a solution of water, ammonia, or ammonium carbonate. Ammonium metavanadate, sodium metavanadate, or vanadium pentoxide is also used in the form of a solution of ammonia and oxalic acid. The oxidizing catalyst of the present invention shows an extremely good activity even at low temperature. For example, at about 100 C, carbon monoxide is 100% oxidized. Also, the oxidation of unburnt hydrocarbon is induced by that of carbon monoxide.

7638 APTIC NUMBER 19316

Newhall, Henry K. and Ibrahim A. El-Messiri
A COMBUSTION CHAMBER CONCEPT FOR CONTROL OF ENGINE EXHAUST AIR POLLUTANT EMISSIONS. Combust. Flame, 14(1):155-158, Feb. 1970. 3 refs.

The design and operation of an internal combustion engine which controls hydrocarbon, carbon monoxide, and nitric oxide emissions are discussed. The primary chamber, which comprises 65-85% of the total clearance volume, is separated from the engine cylinder by a dividing orifice. A fuel injector supplies fuel to the primary chamber; no fuel enters the secondary chamber. Air is drawn into the engine cylinder through the intake port during the inlet stroke

of the operating cycle. During the compression stroke, the air is compressed, and flow through the orifice from the secondary to the primary chamber occurs. At an intermediate point in the compression process, fuel is injected into the primary chamber; toward the end of the compression stroke, it is ignited by a spark plug, located near the dividing orifice. As the flame propagates into the primary chamber, thermal expansion forces high-temperature rich-mixture combustion products into the cool air in the secondary chamber. Thus, NO formation is suppressed, and complete oxidation of CO and hydrocarbons is promoted. Engine power output is controlled by throttling the inlet air supply. At part-load throttle settings, typical of vehicle road-load operation, NO concentrations were below 100 ppm. The maximum value observed for hydrocarbons was 50 ppm, and under all conditions, the CO concentration was less than 1%.

7639 APTIC NUMBER 19312

Nishida, Konosuke
THE COMPARISON ON SOME PRACTICAL CONTROL TECHNIQUES FOR AUTO EXHAUST (II). (Jitsuyoteki jidosha haikiqasu boshiho no hikaku (II)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), vol. 6(4):267-274, April 15, 1970. 25 refs.

The effectiveness of three methods for reducing the amount of unburned gases released to the atmosphere by auto exhaust is presented. Secondary air injection to intake manifold, ignition advancement by a spark modifier, and idle mixture adjustment are the methods compared and discussed. Tests results are summarized. By passing the carburetor, air supplied by a secondary air injector, fed to the intake manifold at idle. The extra air lowers the manifold vacuum to cut off fuel and so eliminate the unburned gases. Test data show a marked decrease in carbon monoxide. The main disadvantage of this method is that the secondary air injector is solenoid-controlled and subject to operating delay. The purpose of the device for idle mixture adjustment is to readjust the idle mixture screw to the correct position. Engines equipped with the device show a marked decrease in unburned gases. The object of ignition advancement by a spark modifier is to increase combustion speed and combustion efficiency by increasing energy from the spark plug. When used in conjunction with idle adjustment, this method effectively reduces emissions and also fuel metering.

7640 APTIC NUMBER 19245

Nobukuni, Taneo, Masatoshi Nakayama, and Eiichi Adachi
A METHOD OF MANUFACTURING ACTIVE CARBON OF HIGH QUALITY FROM THE RESIDUE OF PETROLEUM CRACKING. (Sekiyubunkai zansa yori tokusei no yoi kasseitan seizoho). Text in Japanese. (Asahi Chemical Industries (Japan)) Japanese Pat. Sho 45-5648. 4p., Feb. 25, 1970. (Appl. March 25, 1964, claims not given).

Until now carbon residue of the hydrogen-or town-gas manufacturing process involving the thermal decomposition of petroleum has found no practical application. As active carbon, the residue could not be used because of its extreme fineness and the subsequent difficulty in dispersing it in a solution. In the present invention, the carbon residue is first dried at about 100 C then powdered, and subsequently dispersed in water. After blending with 10-50% of cellulose powder, diatomaceous earth, or similar material, an active carbon with excellent properties is obtained by drying and powdering. Since the carbon residue is extremely fine and contains impurities formed in petroleum cracking, it forms lump when dried. It cannot become an active carbon without pulverizing. When pulverized, however, it becomes an extremely fine powder. When dispersed in water, 50-60 carbon particles coagulate with each other. When cellulose powder is added, carbon lumps are covered with the cellulose, yielding the desired property.

7641 APTIC NUMBER 19569

Nonhebel, Gordon and John Lindon Pearson
WET PURIFICATION OF GASES. (Imperial Chemical Industries Ltd., London (England) U. S. Pat. 2,090,142. 5p., Aug. 17, 1937. (Appl. Dec. 27, 1934, 3 claims).

When flue gases containing sulfur, smoke, or ash are scrubbed in recirculated aqueous media to which lime or chalk is continuously added, scaling of the inside surfaces of a scrubber occurs due to the crystallization of calcium sulfite and sulfate formed by supersaturated solutions. Build-up of a highly supersaturated solution and subsequent scaling are avoided by delaying the return of the liquor to the gas-scrubbing zone until desupersaturation of the liquor by crystallization of the reaction products is substantially completed. During the delay of liquor, its content of suspended calcium sulfite and calcium sulfate is maintained at not substantially less than a predetermined minimum percentage. The delay requires that the liquor capacity of the system be enlarged. This is preferably accomplished by placing a 'delay tank' immediately after the point of addition of lime. To assist in the precipitation of calcium sulfite in the tank, the lime is added to the liquor immediately after it leaves the scrubber. The predetermined minimum quantity of solid calcium sulfite and sulfate in suspension is usually not less than 3% of each. For these concentrations, average makeup water, and a circulating liquor temperature of 50 plus or minus 5 deg, the delay time required for calcium sulfate is about one min per mg equivalent/liter increase in calcium sulfate content per passage of circulating liquor. The delay time for calcium sulfate is in general half the time required for calcium sulfite.

7642 APTIC NUMBER 19426

Norman, W. S.
THE PERFORMANCE OF GRID-PACKED TOWERS. Trans. Inst. Chem. Engrs. (London), vol. 29:226-239, 1951. 10 refs. (Presented at the Institution of Chemical Engineers Midlands Branch Symposium on Packed Columns, April 5, 1951.)

Experiments which elucidate the pattern of liquid flow over the surfaces of stacked grids are described. Transfer coefficients governing the evaporation of water into air and the absorption of ammonia in water in a tower containing a grid packing constructed according to the experimental findings were measured, and the

results are described and correlated. Transfer coefficients calculated by means of an expression based on the frictional resistance to flow are compared with values derived from experiments, and satisfactory agreement is reported. (Author abstract modified)

7643 APTIC NUMBER 19909

Noso, Shigeyuki
DUST COLLECTION FROM WASTE GAS. (Haigasuchuno jokin nitsuite). Text in Japanese. Japan Society of Mechanical Engineers, Proc. Seminar on Air and Water Pollution and their Countermeasures, Japan, 1970, (Taiki ogobi muzi no osen niycru kogai no mondaiten to taisaku ni kansuru koshukai nippon kikaigakkai kansai shibu), p. 79-89. (Jan. 28-29.)

High pressure-loss venturi scrubbers, bag filters, and electrostatic precipitators are often used as dust collectors. These devices have high efficiency, large capacity, automation, and economy. Dust content must be reduced to 0.08 g/cu Nm for converters, or 0.3 g/cu Nm for thermal power plants. An Electrostatic precipitator of 9-12 m is in practical use. Dust collectors include gravitational inertial, centrifugal, purification, filtration, and electrostatic types. Factors to be considered for planning and operation are listed together with their measurements. The quantity of gas to be processed, gas temperature, gas pressure, physical properties of the gas, characteristics of the particulates to be processed, and dust content at the inlet are among the factors to be monitored. The effects on cyclone efficiency of wind quantity, pressure loss, particulate density, particulate diameter, gas temperature, gas viscosity, and dust content at the inlet are also discussed. Operation of an electrostatic precipitator is dependent on gas quantity, composition, diameter, and dust content at the inlet, besides the apparent electrical resistance of a particle. Particle resistance is controlled by gas temperature, water content, blending with heavy crude oil or high sulfur coat at combustion, blowing in of sulfur trioxide, or decrease of dust collecting rate of the primary dust collector.

7644 APTIC NUMBER 19100

Novotny, Pavel
NEW LIGHT ON THE FLUID-PED COMPUSTION OF HIGH-ASH FUELS. Tech. Dig., no. 1:12-15, 1968. 10 refs.

A theoretical basis is developed for two aspects of the fluid-bed combustion process: a steady autothermal combustion process can be maintained with a much lower grade of fuel than the minimum quality needed for classical combustion methods; and the efficiency of the process, judged by the content of combustible matter in the solid combustion residues, actually improves as the ash content in the fuel increases. Not only does the content of combustibles in the solid residues drop off, but losses represented by this residual combustible content are also reduced. A combined numerical and graphical solution is derived to ascertain the minimum quality of any given fuel which will still be capable of maintaining an autothermal combustion process. The relationships thus derived are restricted by the simplifying assumptions applied, and have accuracy only to fuels with a low content of volatile combustibles.

7645 APTIC NUMBER 19476

Nuzum, H. K. and J. P. Walling
CATALYTIC DPCOMPOSITION CF NO IN FLUE GAS. (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohic, Columbus Labs., Grant 5 R01 AP00577, 41p., May 31, 1969. 26 refs.

An investigation is described to find an effective catalyst to decompose nitric oxide in flue gas into nitrogen and oxygen, and to collect data on the amount decomposed as a function of flow rate, amount of catalyst, and temperature. A conventional flow system was used for catalyst screening and more detailed studies; since a fixed-bed catalyst was considered most convenient, the major subsystems were reagent control, reactor, and sampling systems. Analysis was carried out by mass spectrometry and a phenoldisulfonic acid technique. Only one material, Girdler H-219 Nickel Oxide, was found which removed NO at a reasonable rate. After some investigation with this material in pellet form, it was concluded that much of the observed removal was due to adsorption of NO rather than decomposition. Since the results for long periods and at the more practically interesting flow rates were rather poor, the study was terminated with no effective catalysts found.

7646 APTIC NUMBER 19710

O'Neill, Donald
SWITCH TO UNLEADED FUEL OFFERS BENEFITS, POSES PROBLEMS. S.A.E. (Soc. Automot. Engrs.) J., 78(8):17-26, Aug. 1970.

Without lead in the gasoline, cars have reduced hydrocarbon emissions; long-life exhaust catalytic converters become technically feasible. Since valve recession occurs under some high-speed, high-load conditions, engine valve trains must be modified to run with all types of fuels, and engine compression ratios must be reduced and spark timing modified to accommodate the lower octane numbers. Commencing July 1, 1971, every gasoline marketer in California will be required to provide at least one grade of fuel with a minimum 90 octane number that contains a maximum of 0.5 g Pb/gal. Implications of the California proposals on the refining industry are assessed. The deleterious effects of leaded gasoline on catalytic converters and two other exhaust control devices are described. The most immediate benefit accruing from the removal of lead from gasoline is a 20-ppm reduction in hydrocarbon emissions from new cars. Without lead deposits, spark-plug life would be extended and the anti-foul phosphorus additive used in some gasolines could be eliminated. Though experimental particle traps are up to 65% effective, removal of lead from gasoline would eliminate a prime source of particulate matter.

7647 APTIC NUMBER 19258

Oda, Kenichi and Yoshimi Ishihara
A METHOD FOR REMOVING SULFUR DIOXIDE FROM THE FLUE GAS OF A COMBUSTION CHAMBER. (Nenshoro haigasu yori nisankaio wo jokyosuru hoho). Text in Japanese. (Electric Power Industry, Tokyo (Japan), Central Lab.) Japanese Pat. Sho 45-1168. 3p., Jan. 16, 1970. (Appl. April 11, 1966, claims not given).

An improved method of blowing limestone or dolomite powders into a furnace for removing sulfur dioxide is presented. Coarse powders produced by heating the limestone or dolomite are separated and hydrated for reuse. When the limestone is heated in a furnace, calcium oxide is formed and subsequently reacts with sulfur dioxide and oxygen to form calcium sulfate. Thus, the limestone is a powerful desulfurizer. The duration of contact between the calcium oxide and furnace gas, however, is not long enough to obtain the removal of more than 10-30% SO2. When the product of limestone injection was examined with respect to composition and particle size, the coarser particles contained more calcium oxide and less calcium sulfate. When the coarse particles were converted to hydroxides by the addition of water, excellent desulfurization was observed. Experiments with dolomite yielded the same result. In one experiment, kerosene with 1500 ppm SO2 was desulfurized by the present process and also by the conventional one. The desulfurization rate of the former was 82%, while that of the latter was 27%. The present process is an excellent invention for preventing air pollution.

7648 APTIC NUMBER 19266

Bauer, Erich and Franz Reichard
METHOD AND EQUIPMENT FOR THE UTILIZATION OF COMBUSTIBLE WASTE GASES, PRIMARILY THOSE OF OIL REFINERIES. (Verfahren und Einrichtung zum Nutzbarmachen brennbarer Abgase, insbesondere von Erdoelraffinerien). Text in German. (Oesterreichische Mineraloelverwaltung A. G., Vienna (Austria)) Swiss Pat. 481,158. 3p., Nov. 15, 1969. (Appl. March 15, 1966, 16 claims).

Combustible waste gases in mineral oil refineries which have a slight overpressure are usually burned in a flare. This method renders them harmless. To avoid the loss of the heat content of these gases, a method is presented to draw off the gases from the waste gas duct by connecting the latter to a compressor. The suction pressure must be limited to between 30 and 200, preferably 80 mm water atm gauge to avoid penetration of air. The compressor can be designed for normal operation. In the case of excess gas supply, the surplus amount of gas is burned in a flare. One or several pressure sensitive control organs are used for regulating the suction capacity of the compressor. By this method, the waste gas is brought to a pressure which is slightly higher than that in the fuel gas pipe. It thus becomes feasible to let the waste gas enter the fuel gas pipe.

7649 APTIC NUMBER 21643

Ohtsuka, Tadao, Osamu Shimoda, Teruo Watabe, Kuinio Sugino, and Kenji Tanaka
INJECTION TEST OF AMMONIA GAS AND DOLOMITE POWDER INTO OIL-FIRED BOILER. Nippon Kokan Giho (Tokyo), vol. 5:17-24, 1962. 7 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 26p., April 16, 1970.

Tests were conducted to develop a means of counteracting the accumulation of NH4HSO4, a combustion by-product with a low melting point, in the air-heater of oil-fired boilers. The compound is formed when ammonia gas is injected into the combustion gas to neutralize sulfuric acid produced by the combustion of sulfur-bearing fuels. The ammonia injection temperature zone is an important factor in this method. Accordingly, ammonia injection was applied to a boiler in a thermal power plant for one month, using an injection rate of 0.6/0.07 wt % of fuel oil fired, and an injection temperature zone of ~180 C in the flue gas. A satisfactory reduction of NH4HSO4 accumulation was obtained under these operating conditions. Experiments were also conducted on the effectiveness of dolomite powder injection in reducing corrosion caused by sulfuric acid in the combustion gas; using an air-cooled corrosion probe, reduction of corrosion was observed to begin at an injection level of 0.3 wt % of fuel coil fired. Injection of fly ash also showed some potential as a low-cost method of reducing corrosion. (Author summary modified)

7650 APTIC NUMBER 19174

Okita, Toshiichi and Hirotake Katayama
ADSORPTION AND OXIDATION OF SULFUR DIOXIDE AT ORDINARY TEMPERATURE. II. MEASUREMENT OF ADSORPTION AND OXIDATION OF SULFUR DIOXIDE ON THE SURFACE OF ALUMINUM OXIDE AND FLY-ASH PARTICLES. Text in Japanese. Bull. Inst. Public Health (Tokyo), 17(3):203-207, 1968.

Adsorption and the subsequent oxidation of sulfur dioxide on the surface of aluminum oxide and fly-ash particles was studied. The weight Y1 (in micrograms) of sulfur dioxide, plus sulfur dioxide adsorbed on 1 g of aluminum oxide particles, was related with the sulfur dioxide concentration X (ppm) as expressed by Y1 equals 14X to the 0.28 power. The weight Y2 of sulfur dioxide on 1 g of fly-ash particles was about 1/100 of that of aluminum oxide particles, while the relation between Y2 and the sulfur dioxide concentration was roughly represented by Y2 equal to 0.095X to the 0.55 power. The rate of oxidation of sulfur dioxide on aluminum oxide particles was dependent on the sulfur dioxide concentration. In addition, the air temperature and humidity also seemed to affect the rate of oxidation. (Author abstract)

7651 APTIC NUMBER 19421

Oliver, Thomas C.
PRODUCTION OF SULPHUR. (Chemical Construction Corp., New York, N. Y.) U. S. Pat. 2,068,430. 4p., Jan. 19, 1937. (Appl. June 9, 1934, 11 claims).

A method is given for producing sulfur from sulfide ores which avoids discharging SO2 waste gases into the atmosphere, saves the SO2 content, and at the same time increases the capacity and efficiency of the reduction and sulfur recovery equipment. The ore is burned in a restricted space with a pre-heated oxygen-containing gas until all the sulfur has been burned out to

form a strong SO2 gas at high temperature. This gas is passed in a heat exchange with the combustion gas to preheat the latter, and the SO2 reduced to produce a waste gas. The SO2 is absorbed and the absorbing liquid then removed from contact with the waste gases, SO2 removed from this liquid, and an SO2-bearing combustion gas formed. This is used as at least part of the combustion gas for burning the ore whereby the SO2 content of the gas is added to the SO2 produced by combustion of the ore.

7652 APTIC NUMBER 19397

Opekar, P. C. and R. G. Goar
THIS COMPUTER PROGRAM OPTIMIZES SULFUR PLANT DESIGN AND OPERATION.
Hydrocarbon Process., 45(6):181-185, June 1966. 12 refs.

A digital computer program which optimizes Claus-type sulfur plant design and operation is described. Evaluations of several basic questions, such as choosing process flow schemes, number of condensation steps, and reheating method, optimizing the number of conversion steps in an economic balance between investment and recovery, deciding on the operating temperature of the catalytic converters and sulfur condensers, detecting catalyst de-activation, and determining fuel stream composition, can be done in a fraction of the time it takes by hand. The results of a typical optimization study are given to illustrate the benefits which can be realized.

7653 APTIC NUMBER 19028

Ortuno, Angel Vian
PROCEDURE FOR RECOVERY OF SULFUR DIOXIDE CONTAINED IN INDUSTRIAL GASES IN ANY CONCENTRATION WHATSOEVER. (Procedimiento para aprovechar el dioxido de azufre contenido en gases industriales de cualquier concentracion). Text in Spanish. (Empresa Auxiliar de la Industria S. A. (Spain)) Spanish Pat. 261,844. 6p., May 19, 1960. (Appl. Oct. 20, 1960, 9 claims).

This process, relevant to the recovery of sulfur dioxide contained in a gas mixture at a concentration of less than 6%, consists of adding to the gas mixture a weak base (weaker than ammonia) which combines with the SO2 to form a sulfite, which in turn is oxidized to a sulfate. Oxygen is supplied in the amounts needed if it is not already contained in the mixture. This sulfate, appearing in the form of a mist, can be recovered by some conventional process, after which it is made to react with ammonia to form ammonium sulfate. The original base, liberated by this reaction, can be recovered and recycled. An example of such a base is quinoline, added to the mixture in such quantities that the SO2-quinoline ratio by weight will be 0.49.

7654 APTIC NUMBER 21880

Panzica, Nicholas John, Robert MacDonald Jamison, and Emil Uebricht
GAS PURIFIER. (Laveur de gaz). Text in French. (Ajem Labs, Inc., Livonia, Mich.) Swiss Pat. 453,300. 6p., March 31, 1968. (Appl. June 23, 1965, 11 claims).

This patent corresponds to U. S. Patent 377,190 of June 23, 1964. The gas is brought in contact with and absorbed by atomized droplets of the washing liquid, passed across a series of baffles, and impelled by a blower. The washing liquid is atomized by means of a rotating frame, open at one end, into which the liquid is injected by means of a pump. The atomizer can also be a rotating disk equipped with several blades. The baffles are arranged vertically in a V formation. The purifier contains regulators that quantitatively control the passage of the gas to be purified. The passageway can be divided into two sections, each of which can be alternately blocked off by panels, these being operated by the regulator device.

7655 APTIC NUMBER 21983

Parkison, Robert V.
THE ABSORPTION OF SULPHUR DIOXIDE FROM GASES OF LOW CONCENTRATION. TAPPI, 39(7):522-527, July 1956. 13 refs.

Absorption experiments are reported on three systems: (1) oxygen-water; (2) high-concentration (5 to 16%) sulfur dioxide-water; and (3) low-concentration (0.5 to 1.5%) sulfur dioxide-water. The low concentration range is encountered in the flue gases from recovery furnaces burning spent pulping liquor. The absorbing medium was water in packed towers. The results are expressed in terms of over-all coefficients, which would be an adequate design criterion. The low-concentration and the high-concentration coefficients should be in agreement at high gas rates, with the low-concentration coefficients showing a stronger function of gas rate and being significantly lower at low gas rates. The desorption coefficient for the oxygen-water system is not a function of gas rate. The results are discussed in terms of existing absorption theories.

7656 APTIC NUMBER 19016

Parkison, Robert V.
THE SOLUBILITY OF SULPHUR DIOXIDE IN WATER AND SULPHURIC ACID. TAPPI, 39(7):517-519, July 1956. 8 refs.

Interest in the removal or recovery of sulfur dioxide from spent liquor furnace stack gases emphasizes the need for low-concentration solubility data for sulfur dioxide in water and other solutions of industrial importance. A large number of solubility data have been reported for sulfur dioxide at high partial pressures (0.10 to 0.33 atm.), but data for partial pressures below 0.04 atm are lacking. A series of solubility determinations were made at partial pressures below 0.04 atm for water and dilute (0.0580 molal) sulfuric acid over the temperature range of 50 to 90 deg F. Results of the experiments are discussed. (Author abstract modified)

7657 APTIC NUMBER 21792

Parson, Daniel
POLLUTION-ITS EFFECT ON GAS MARKETING. Pipeline Gas J., 197(8):67,69,70, and 72, July 1970.

The impact of the general pollution problem on the natural gas industry is discussed. The industry cannot supply enough gas to allow companies to discontinue using coal and oil. Natural gas supplies should not be used to abate air pollution created by large industrial firms. Whenever possible, coal and oil should continue to be used, with the resulting pollution controlled by mechanical devices. This would allow the gas industry supply to be extended, rather than depleted. Adequate price incentives should be afforded to allow undiscovered supplies of gas to be converted to proven reserves and productive wells. The social cost to the nation of inefficient use of natural resources is substantial, and must be considered. To supply natural gas to 54 metropolitan areas, incremental pipeline and distributor investment would involve $10.5-billion to $24-billion for the needs of the nation as a whole. Conversion from coal and oil to natural gas represents an additional operating cost of $2 to $5 billion annually.

7658 APTIC NUMBER 19413

Patton, Richard A.
CONVERSION OF SULFUR DIOXIDE TO SULFUR WITH HYDROQUINONES. (Texas Gulf Sulphur Co., New York) U. S. Pat. 2,657,119. 3p., Oct. 27, 1953. 9 refs. (Appl. July 6, 1950, 10 claims).

A continuous, cyclic process is described for the electrolytic reduction of sulfur from sulfur dioxide-bearing gases, by bringing these gases into contact with an aqueous solution of any hydroquinone having an oxidation potential of more than -0.47 volt. In the process, the hydroquinone is converted to a quinone and then regenerated again to a hydroquinone for re-use. An example is given using anthraquinone. Any known apparatus for effectively contacting a liquid with a gas may be used.

7659 APTIC NUMBER 21975

Pearson, D. A., L. A. Lundberg, Frank R. West, and Joseph L. McCarthy
ABSORPTION ON A SEMI-WORKS SCALE. Chem. Eng. Progr., 47(5): 257-264, May 1951. 30 refs.

The influence of tower height and of chemical reaction between the solute and solvent have been investigated for the absorption of sulfur dioxide in water in a semi-works scale packed tower over the comsercial range of operating conditions. The tower was packed with 1-in. Raschig rings. Because of the close approach to equilibrium in many of the runs, the literature dealing with equilibrium solubility of sulfur dioxide in water was studied, smoothed, and correlated to yield recommended equations representing the equilibrium over a range of 0 to 50 C and of 0 to 800 mm Hg of sulfur dioxide. Experimental mass-transfer data are expressed in terms of heights of transfer units. These agree satisfactorily with similar sulfur dioxide absorption data secured from a tower one tenth as tall in which end effects were eliminated. The experimental heights of transfer units range from approximately those predicted by theusual correlations on up to twice these values. Much better agreement is obtained when the results are expressed as pseudoheights of transfer units corresponding to pseudoequilibrium and operating lines. (Author abstract modified)

7660 APTIC NUMBER 19407

Perotin, J. P. and R. Werderer
RADIOACTIVE CONTAMINATION IN WORKSHOPS AND LABORATORIES. VOLUME II. COLLECTIVE PROTECTION TECHNIQUES. Commissariat a l'Energie Atomique, Saclay (France), Groupe Chimie et Effluents, Rept. SPR/67-558, 1967. 78 refs. Translated from French by E. M. Gillis, Atomic Energy Research Establishment, Harwell (England), Information Branch, 92p., 1968.
CFSTI: PB 185821-T

Studies and experiments are reported relative to the general properties of radioactive contaminants and the characteristics of atmospheric contamination. The control of atmospheric contamination was approached from the point of view of localizing contamination and conducting it through controlled channels to a point where it can either be collected or diluted sufficiently prior to its releases to the atmosphere to eliminate any possibility of external contamination. The physical and chemical contamination of surfaces is also discussed, along with measures for their prevention.

7661 APTIC NUMBER 12253

Perry, Harry and J. M. Field
COAL AND SULFUR DIOXIDE POLLUTION. Preprint, American Society of Medical Engineers, New York, 9p., 1967. 19 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, Pittsburgh, Pa., Nov. 12-17, 1967.)

Presently about 143 million tons of pollutants per year are discharged into the air over the United States. Carbon monoxide represents about one-half of all pollutants, sulfur oxides are the next largest pollutant (15% of the total emission) followed by hydrocarbons and nitrogen oxides. To reduce sulfur oxide in the atmosphere, the following measures can be taken: use of low-sulfur fuels; desulfurization of fuel prior to use; selective mining of coal; injection of desulfurizing additives into the boiler; removal of sulfur oxides from stack gases; dispersion and dilution of the sulfur oxides through high stacks; mine mouth generation of power; and use of nuclear energy. Removal of sulfur oxide during in-process combustion has the advantage of being applicable to many existing plants where stack removal processes would be physically impossible to install. Reduction of the sulfur content of medium and high-sulfur coals is particularly beneficial for existing power plants and for all small installations. Froth floatation is less suited for this purpose, since pyrite and coal have similar surface properties. As a consequence, little sulfur reduction is achieved. Oxidation of

pyrite to sulfur is prohibility expensive. Removal of SO2 from stack gases offers hope of the greatest reduction of this pollutant. The Reinluft process, Monsanto process, and the alkalized alumina process are briefly outlined. Capital investment of these processes ranges from 10 to 20 dollars per installed kilowatt with operating cost of about 0.75 to 1.50 dollars per ton of fuel burned after allowing credit for by-products. Mention of the Japanese Kiyoura process and the DAP-Mn process is also made.

7662 APTIC NUMBER 21757

Pich, Josef
THE PRESSURE DROP IN FABRIC FILTERS IN MOLECULAR FLOW. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(10):10-11, Oct. 1969. 9 refs. (Presented at the Colloque international sur les atmospheres polluees, Paris, France, Nov. 14-15, 1968.)

The resistance theory of pressure drop in fiber filters is briefly summarized. The equation for the resistance of circular cylinders at large Knudsen numbers (molecular flow) is approximated for the field of small match numbers. By using the approximation, it is possible, on the basis of resistance theory, to derive an approximate equation for pressure drop in fiber filters at moledular flow. Qualitative agreement with this equation is found by experiments. (Author summary modified)

7663 APTIC NUMBER 19032

Plaks, Norman
CONTROL OF SULFUR OXIDES AND NITROGEN OXIDES. Preprint. American Society of Heating, Refrigerating and Air Conditioning Engineers, New York, 14p., 1970. 5 refs. Presented at the American Society of Heating, Refrigerating and Air Conditioning Engineers Annual Meeting, San Francisco, Calif., Jan. 18-22, 1970.)

The rate at which the emissions of sulfur and nitrogen oxides increase and the time at which they will start to decrease, if at all, are functions of (1) whether the breeder reactor is developed on schedule; and (2) the rate at which control processes are developed and demonstrated. Fuel substitution will have limited applicability mostly for geographic and economic reasons, although it can be applied to combustion processes of all sizes and might be the only control method available for smaller combustion processes. The category of fuel substitution includes use of low-sulfur coal, natural gas, and desulfurized fuel oils. When they are fully developed and demonstrated, fuel and flue gas desulfurization processes will bear the brunt of most of the sulfur oxide control that has been projected both with and without the breeder reactor being developed on schedule. Changes in the combustion process offer the greatest hope for decreasing nitrogen oxide emissions, although flue gas desulfurization processes might be required simultaneously. (Author summary modified)

7664 APTIC NUMBER 19170

Plato, Horst
RAPPING OF COLLECTING PLATES IN ELECTROSTATIC PRECIPITATORS. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(8):22-31, Aug. 1969. 13 refs.

Tests were performed in an electrostatic dust separation cell and in an industrial, horizontal electrostatic precipitator to investigate the efficiency of the rapping process and dust transfer into the bunker. In the first test arrangement, cleaning of the collecting plate (80/80/1mm) was effected by transverse acceleration with one rapping blow to the center of the plate. The gas cycle (air) was set at a mean flow rate of 0.93 m/sec and a gas temperature of 100 C was used in the separation cell. Dust concentration was 10 g/cu m air to ensure rapid coating of the plate. It was found that the cleaning effect of the rapping operation depended on the dust quantity deposited on the plate prior to rapping. For the second test series, a horizontal precipitator with 40 passages and designed for a mean gas flow rate of 1 m/sec was used. The collecting plates were 7.5 m high and 4 m long; the rapping interval of the precleaning stage was 2.5 min and that of the secondary stage 6.7 min. Cleaning was effected by the transfer of rapping vibrations from other plates via the common suspension to plates not being directly rapped. The amount of dust which does not reach the bunker depends on the amount of dust removed by the cleaning operation. The dust removed by rapping reaches the bunker in the form of dust clouds.

7665 APTIC NUMBER 21956

Pleham, Eugene J.
ANALYTICAL HEAT TRANSFER INVESTIGATION OF INSULATED LIQUID METHANE WING TANKS FOR SUPERSONIC CRUISE AIRCRAFT. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Rept. E-5258, Work Unit 720-03, NASA TN D-5641, 37p., Jan. 1970. 13 refs.
CFSTI: NASA TN D-5641

Liquid methane boiloff from wing tanks was computed for typical SST missions for cruise Mach numbers of 2.7, 3.0, 3.5; insulation thicknesses varied from 0.5 to 2.0 in. with various vent pressure settings and saturated and subcooled fuel. Boiloff rates during fuel fill and ground hold are discussed. Boiloff losses less than one and one-half percent are possible for cruise Mach numbers up to 3.5 for an insulation thickness of 1 inch. (Author abstract)

7666 APTIC NUMBER 19410

Powell, Alfred R.
RECOVERY OF SULFUR FROM FUEL GASES. Ind. Eng. Chem., vol. 31:789-796, July 1939. 25 refs.

A review is presented of processes for the by-product recovery of sulfur from the hydrogen sulfide routinely removed from fuel gas before distribution. Recent developments in Europe and the U. S. are summarized. Several different processes of liquid purification are in commercial operation in the U. S. in which solid elemental sulfur is the end product. In general, these

operate in two steps: in the absorption step, the solution absorbs H2S from the gas; and in the actification step, the solution is regenerated for further use. The Ferrox and Thylox processes of this type are discussed. In another group, the sulfur is recovered as gaseous H2S; oxidation is avoided and generation is achieved by releasing the absorbed H2S by contacting the solution countercurrently with a flow of steam, which is then condensed, leaving the recovered H2S. Under this category of hot-actification types, the Aspenhahn, Girdler, Phosphate, and Phenolate processes are described. In both the liquid-purification and hot-actification types of processes, the differences among the various methods lies chiefly in the nature of the absorbing solution. Final processing, depending on economic and marketing conditions, and uses for recovered sulfur are summarized; solid sulfur has medicinal and agricultural applications, and H2S is frequently converted into sulfuric acid.

7667 APTIC NUMBER 19349

Proctor, R. C.
CRYOGENIC IN-GROUND STORAGE. J. Petrol. Technol., vol. 16:393-396, April 1964. (Presented at Society of Petroleum Engineers, Annual Fall Meeting, New Orleans, Oct. 6-9, 1963.)

Design and construction features are presented for the storage unit of the Transcontinental Gas Pipeline Co. that is now being built in the New Jersey Meadows near Carlstadt. Designed for a working volume of 296,000 bbl of LNG at a temperature of -260 F, the unit is 115 ft in diameter and extends 165 ft below existing grade. Its location is an area of alluvial soils, consisting of silty clays and sands, and has a major portion of its construction in the underlying Manhattan red shale. Cryogenic in-ground storage is an economical method of storing large volumes in areas that would not permit the construction of above-ground storage with its required dikes. The self-sealing nature of this method, its underground non-spilling location, and limitations on fire exposure permit recommended clearances of 150 ft, compared to the 400 ft clearance required on above-ground storage. Thorough site investigation is required before final determination of its feasibility, although it can be used in most soil and rock formations. It can be built to give any desired boiloff rate above the minimum and has the inherent characteristic of improving with age. Protection of its contents is afforded from disasters and, in the event of fire, it confines the fire to a small area where it can be easily controlled. (Author summary modified)

7668 APTIC NUMBER 21723

Rabenhorst, D. W.
PRIMARY ENERGY STORAGE AND THE SUPER FLYWHEEL. Johns Hopkins Univ., Silver Spring, Md., Applied Physics Lab., Contract NOw 62-0604-c, TG 1081, 60p., Sept. 1969. 11 refs.
CFSTI, DDC: AD 697906

New flywheel configurations (disc and blunt bar) promise an order of magnitude improvement as energy storage devices. As presently conceived, the energy density has been improved over ten times, with the prospect for additional improvement in performance as the next generation of high-strength uniaxial filamentary materials becomes available. The significance of the super flywheel is typified by its application to the urban electric vehicle. Instead of being used only to reduce the acceleration power requirements, as has been proposed in many studies, the new flywheel can actually be used as the primary energy source; batteries can be eliminated altogether. The flywheel's principle advantage is that it can produce any desired frequency or voltage output. If 5000 volt, 400 Hz power is required for a particular mission, then it is only necessary to couple the flywheel to a generator having these characteristics. The super flywheel can be charged directly from any desirable power source such as the hydro-turbine, the cyro-turbine, the gas turbine, and the internal combustion engine, or free electric, hydraulic, or solar power. Its cold weather operation should be outstanding, since the rotor bearings are dry lubricated and the performance of the associated electrical equipment usually increases with a decrease in temperature.

7669 APTIC NUMBER 19922

Regehr, U.
POSSIBILITIES FOR REDUCING LIQUID DROPLET EMISSIONS. (Moeglichkeiten der Verminderung tropfenfoermiger Emissionen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:344-351, 1970. 8 refs.

The subject of eliminating liquid impurities from waste gases is reviewed, with special attention to the principles governing inertia-type separators, power expenditure, and results obtained in large plants. The use of electrostatic equipment is practical only in the removal of sulfuric acid mists. The use of a system depending on the principle of inertia is effective for droplets with a minimum diameter of 0.001 mm. High operating speeds are advantageous in such a system, if properly constructed. In most industrial processes, the range of liquid droplet diameters is between 0.001 mm and 2 mm. There are two types of liquid separators based on the inertia principle: the cyclone-type and the screen-type, the latter being discussed in detail. A large fertilizer plant makes use of this type of device as a final stage, following the removal of dust and ammonia gas by a wet process. It has a throughput capacity of 250,000 cubic meters per hour. The separator is a Euroform model TS 5, which is capable of providing a separating efficiency of better than 99.9%. For a flow rate of 4.5 meters per second, the pressure drop is less than 15 mm H20.

7670 APTIC NUMBER 19231

Reichel, H.
METHODS FOR CLEANING AND SEPARATING GAS MIXTURES. (Prinzipien fuer die Reinigung und Trennung von Gasgemischen). Text in German. Tech. Mitte., 63(6):255-258, June 1970. 8 refs.

The basic principles of the following gas cleaning and separating methods are reviewed: chemical conversion, adsorption,

absorption, phase change, diffusion, fractionated condensation, and rectification. In almost all chemical conversions, solid catalysts are used. The pollutant is converted into a harmless substance or to a substance which can be removed by a simple method. Organic sulfur compounds in hydrocarbon flows are converted with hydrogen to hydrogen sulfide. Adsorption is the binding of pollutant on the surface of an adsorbent by van der Waal's forces. The adsorption of water and carbon dioxide from gas mixtures, of sulfur compounds from natural gas, and of solvents from air are cited as examples. By cooling a gas mixture, one or more components may become liquid or solid and can be separated. By absorption, pollutants are not only bound on the surface of an absorbent but also in the interior. Mostly liquids are used as absorbents which are brought in close contact with the gas which is to be cleaned. In order to obtain purest gases with a pollutant concentration of less than 0.01 ppm, the gas flow is passed through a semi-permeable membrane of special material which is impermeable to the pollutant. Fractionated condensation is based on cooling a gas flow below the dew point, thereby a liquid fraction is obtained which can be separated. In rectification, a liquid is passed countercurrent to steam, and a substance exchange takes place.

7671 APTIC NUMBER 19263

Reichel, H.
PRACTICAL EXAMPLES FOR CLEANING AND SEPARATING GASES. (Praktische Anwendungsbeispiele fuer die Reinigung und Trennung von Gasen). Text in German. Tech. Mitt., 63(6):267-272, June 1970.

The cracking gas developing at ethylene production contains carbon dioxide, hydrogen sulfide, and water. These impurities are removed by scrubbing with sodium lye. The various separation processes until pure ethylene is obtained are described in detail. In synthesis of ammonia, a cracking gas is obtained from processes of partial oxidation which contains 50% by volume CO, which is converted into CO2 and H2. The hydrogen contains up to 35% by volume of CO2, as well as H2S, COS, CO, AR, and CH4. These impurities are removed by scrubbing with Rectisol-N2. The scrubber operates at a pressure of 70 atm gauge. After injection of methanol to prevent ice and hydrate formation, the gas is cooled and H2S is removed in the lower section of the tower. In the upper part, CO2 is scrubbed out.

7672 APTIC NUMBER 21992

Remillieux, J.
NEW TEXTILE FILTER METHOD FOR ELIMINATING ACID MISTS. (Nouveau procede a tissu pour l'elimination des brouillards acides). Text in French. Preprint, 17p., 1968. 4 refs.

The development of synthetic fibers such as polyvinyl chloride and polypropylene has increased the possibility of the use of textile filters in removing acid mists, due to their remarkable chemical inertness and their relatively strong resistance to high temperatures. A single filter is used when the pressure drop is 100-300 mm H2O for a range of filtration speeds between 0.3 and 3.0 cm/sec. When a single filter is used, the yield decreases noticeably for a high rate of gas flow. Multiple filters are used when the pressure drop is 300-600 mm H2O for filtration speeds in the range of 1-10 cm/sec. A greater expenditure of power is needed for multiple filters, but the yield remains high at higher rates of gas flow. The filters are sprayed with a washing fluid at the rate of 0.5 liters/cu m of gas for low-speed simple filters, increasing to as much as 6 liters/cu m for double thicknesses. The procedure has been used industrially, in conjunction with an electrostatic process; the result is an almost 100% yield. The cost of power expended for this process is compensated by a definitely lower original investment in the equipment.

7673 APTIC NUMBER 19926

Renault, Philippe
PROCESS FOR PURIFYING SULFIDE CONTAINING GASES AND THE RECOVERY OF SULFUR THEREFROM. (Inst. Francais du Petrole, des Carburants et Lubrifiants, Paris (France)). U. S. Pat. 3,516,793. 5p., June 23, 1970. 9 refs. (Appl. Sept. 13, 1966, 17 claims).

A process for removing hydrogen sulfide from waste gases and producing elemental sulfur is described. The H2S-containing gas is contacted with an absorption solution of alkanolamine or morpholine in a monoalkyl ether of a polyhydric alcohol. The alkanolamine concentration should be 1 to 10% of the weight of the glycol monoether. The H2S-containing solution is treated with molecular oxygen to form elemental sulfur and water. Sulfur is separated with the provision that the alkanolamine or morpholine concentration is 0.1% to 50% of the weight of the monoether and that the solution contains less than 50% water. The solution is then treated with soda or potash in aqueous solutions to remove any by-products. This regeneration of the absorption solution is conducted at 100-130 C. The absorption and oxidation treatments are simultaneous and occur in the same reaction zone.

7674 APTIC NUMBER 19387

Beyerson, L. H. and L. F. Swearingen
THE ADSORPTION OF GASES BY METALLIZED SILICA GELS. J. Phys. Chem., vol. 31:88-101, 1927. 6 refs.

The adsorption of gases upon silica gels metallized with silver, copper, platinum, and palladium were measured at temperatures of 0, 68.5, 100, 138, and 218 deg. The apparatus consisted of an adsorption bulb connected to a mercury manometer, and a water-jacketed gas-measuring burette, all connected to an evacuating system. Hydrogen is adsorbed appreciably more upon the copper, platinum, and palladium treated gels, while carbon monoxide is specifically adsorbed by all the metallized gels except copper. Oxygen is very specifically adsorbed by the copperized gel. The other metallized gels also exhibit specific adsorption for oxygen. There appears to be no marked specific adsorption of the gels for methane. The metallized silica gels all adsorb ethylene more strongly than does silica gel.

The adsorption of carbon dioxide gives little evidence of a specific effect, except perhaps in the case of copper. (Author summary modified)

7675 APTIC NUMBER 21965

Rickles, Robert N.
WASTE RECOVERY AND POLLUTION ABATEMENT. Chem. Eng., vol. 72:133-152, Sept. 27, 1965. 112 refs.

Various methods presently available for the treatment of liquid and gaseous effluents were discussed. Methods and processes that have been used or proposed for the recovery of valuable products were stated as follows: biological oxidation, biological reduction, and chemical oxidation; sedimentation tanks, thickness, flocculation tanks, cyclones, centrifuges, screens, filters, and membrane sieves; foaming and flotation; adsorption; ion exchange; membrane processes solvent extraction; and evaporation and crystallization. The extent of participation of the various segments of the chemical processing industry in the abatement/by-product recovery program was illustrated by specific examples from the petrochemical industry, coal and coke industry, phosphate fertilizers, petroleum industry, and pulp and paper industry. The extent of government involvement, both federal and state, was brought out by listings of federal R&D agencies, state programs of air and water pollution control, state assistance provided for waste treatment facilities, and key provisions of proposed legislation in the area of tax relief to companies buying control or abatement equipment. The prediction was made that when public and governmental pressure becomes great enough, industry will find a way to make a profit out of waste control.

7676 APTIC NUMBER 19441

Rightmire, R. A. and A. L. Jones
FAST CHARGE MOLTEN SALT BATTERIES. Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 42-45. 7 refs. (May 16-18.)

The combination of a hydrocarbon fuel cell or small internal combustion engine with a battery has been proposed as a possible means of overcoming range or power limitations of electric vehicles. However, this requires a battery of high power-density and fast recharge rate. A battery is described which should have charge and discharge rates that meet the requirements of hybrid vehicles. The battery is a simple secondary molten salt cell using proprietary carbon cathodes and solid proprietary lithium containing anodes. The electrolyte is molten lithium chloride. Projected capacity and power are 75 watt-hours/pound and 200 watts/pound respectively based on the weight of the electrodes and electrolyte. Currently 75% of the weight consists of the weights of the container, terminals, seals, and excess electrolyte. Designs are being developed in which the active components represent about 50% of the total cell weight. A properly designed hybrid vehicle (average size passenger car) would require a primary power source in the 20-30 HP range. Because the primary engine operates under more optimum conditions than the conventional vehicle, over-all fuel requirements should be considerably less. For operating in cities without the primary engine, a 4 cu ft accumulator (about 400 lbs), storing 50 watt-hours/lb would contain enough energy to propel a compact vehicle about 50-100 miles. This covers 97% of all daily auto trips made in the U. S. A 400 lb battery having a peak power density of 200 watts/lb would be capable of providing the energy to accelerate a 2500 lb vehicle from 0-60 MPH in 10 seconds.

7677 APTIC NUMBER 19935

Roberts, Edward S., Arnold Gunther, and Casimir A. Rogacki
SULFUR DIOXIDE RECOVERY PROCESS. (Treadwell Corp., New York, N. Y.) U. S. Pat. 3,511,027. 12p., May 12, 1970. 7 refs. (Appl. March 26, 1968, 8 claims).

A process to recover sulfur dioxide from combustion gases by absorption is described. Carried out in a packed tower, the process utilizes an ambient temperature recirculating water spray to cool the gases down to a temperature where effective absorption can take place. Another water spray is employed where the major absorption takes place, as well as a series of flash absorptions at progressively lower pressures. The product gas obtained is typically about 30% SO2 as compared with about 0.2% in the original combustion gas. An important advantage of this process is that the final SO2 concentration is sufficiently high to allow direct use in a sulfuric acid plant. The system described can, with little modification, be used to recover other products.

7678 APTIC NUMBER 19033

Roll, Kempton H.
CONTROLLING CORROSIVE AIR POLLUTANTS. J. Air Pollution Control Assoc., 1(6):6-10, May 1952.

Control of an aerosol, such as sulfuric acid mist, is a problem of collection, but an entirely different technique must be utilized in the case of a gas such as sulfur dioxide. Conversion of SO2 to H2SO4 is a possibility, as is absorption of the gas in chemicals from which it can be recovered as pure SO2. Hydrogen sulfide is now being treated in a number of oil refineries by burning it in air to convert it to sulfur dioxide and water vapor or by burning it in the presence of sulfur dioxide to convert it to elemental sulfur and water vapor. It is common practice to add an electrostatic precipitator at the end of the processing circuit through which all gases bearing sulfuric acid mist must pass. As the gases pass through the precipitator, they receive electrical charges which cause them to coalesce, whereas the sonic collector operates on the principle that high intensity sound will cause particulate matter to agglomerate and descend to the bottom for removal. One of the newest and most successful methods of converting sulfur dioxide to liquid involves dissolving the impure gas in cool dimethylaniline and extracting it as pure SO2 by heating the pregnant dimethylaniline solution.

7679 APTIC NUMBER 21883

Romell, Dag
METHOD AND EQUIPMENT FOR SEPARATION OF SOLID OR LIQUID PARTICLES FROM A GAS FLOW. (Verfahren zum Abscheiden von festen oder fluessigen Teilchen aus einem Casstrom und Einrichtung zur Durchfuehrung des Verfahrens). Text in German. (Assignee not given.) Swiss Pat. 456,542. 6p., May 31, 1968. (Appl. April 8, 1967. 9 claims).

A method was developed for the separation of solid or liquid particles from a gas flow by an electrically charged scrubbing liquid. Electricity is generated for charging the scrubbing fluid, while the particles in the gas flow are charged with polarity opposite to that of the cleaning fluid. They are charged with corona discharge by the same machine as used for the scrubbing fluid. The equipment consists of a chamber with square cross section. Along the two opposite sides of the chamber in the direction of flow are the electrodes, while between the electrodes are nozzles for the injection of the scrubbing fluid. Each nozzle on one side faces an electrode on the opposite side; some of the nozzles in the square chamber are part of the liquid influence machine.

7680 APTIC NUMBER 19134

Rosenstein, Ludwig and Leonard Klein
PROCESS OF REDUCING SULPHUR DIOXIDE. (United Verde Copper Co.) U. S. Pat. 1,967,265. 6p., July 24, 1934. (Appl. July 22, 1931, 12 claims).

A method is described for recovering elemental sulfur from sulfur dioxide. The elemental sulfur is obtained by the reduction of sulfur dioxide by means of a reducing agent capable of combining with the oxygen of the SO2 to form a substance which is non-volatile at the temperature of the reaction and from which the added oxygen may be readily removed to regenerate the original reducing agent. Furnace gases containing SO2 may be employed directly or the SO2 may be concentrated to provide essentially pure SO2. Substances which may be used advantageously as reducing agents include alkali and alkaline earth metal sulfides and aluminum compound such as reduction products of potassium alum and alunite. Preferred is a hydrated mixture of calcium sulfide and magnesium sulfide. The reaction is carried out at a temperature in excess of 700 C, preferably between 850 and 950 C. The gases issuing from the reaction chamber will consist of sulfur vapor and inert gases such as nitrogen. The sulfur vapor is cooled to condense the sulfur which is recovered in suitable forms for marketing. The spent reducing agent is regenerated by reducing it to a sulfide with a hydrocarbon gas such as natural gas. The system is conceived of as operating with multiple reaction chambers in parallel so that while some chambers are reducing SO2, others are regenerating the reducing agent and the production of sulfur is essentially continuous. When furnace gases are used, they should be pre-cleaned to remove dust, arsenic compounds, and selenium compounds. The process is claimed to be a relatively inexpensive method of producing market-ready elemental sulfur without the production of poisonous or corrosive gases.

7681 APTIC NUMBER 19135

Rosenstein, Ludwig
RECOVERY OF SULPHUR. (United Verde Copper Co.) U. S. Pat. 1,967,264. 2p., July 24, 1934. (Appl. Nov. 28, 1930, 3 claims).

A process is described for producing hydrogen sulfide from the reaction of sulfur dioxide with a hydrocarbon gas such as natural gas at elevated temperatures and in the presence of a suitable contact agent. The contact agent is prepared by dehydrating sulfates of calcium, magnesium, barium, or manganese and reducing the dehydrated sulfate to a sulfide with a hydrocarbon gas. The SO2 can be obtained from the exhaust gases of smelters or roasters of sulfide ores. The temperature of reaction is maintained in excess of 600 C. The prevention of elemental sulfur as a product of the reaction is accomplished by providing an excess of the hydrocarbon gas to the reaction, allowing sufficient time for the reaction to go to completion, and providing for intimate contact with the contact agent in the mechanical layout of the reaction chamber.

7682 APTIC NUMBER 19418

Rosenstein, Ludwig
RECOVERY OF SULPHUR. (United Verde Copper Co.) U. S. Pat. 1,941,623. 3p., Jan. 2, 1934. (Appl. Nov. 28, 1930, 10 claims).

A method is described for recovering elemental sulfur from waste gases, in which a mixture of sulfur dioxide and hydrogen sulfide gases are passed through a rigidly-walled space in which liquid films of water are maintained on the walls. The SO2 and H2S are reacted at a temperature above the melting point of sulfur in the presence of a granular mass of material having surface films of liquid water on its constitutent particles. A suitable reaction chamber would be a vertical tower having shelves arranged to provide a tortuous path for the gas stream to follow, with the granular carrier substance placed in beds on the shelves; the films of water on the particles are maintained by a spray of water at the top of the tower. Possible substances for the granular carrier material include mineral gels, carbonaceous matter such as bone char, charcoal, or cellulose materials, and insoluble aluminum compounds.

7683 APTIC NUMBER 19180

Ruegg, Rudolf
CYCLONE WITH LOUVER. (Umluftsichter mit unterer Jalousie). Text in German. (Escher Wyss G.M.B.H., Zurich (Switzerland)) Swiss Pat. 470 214. 3p., March 31, 1969. (Appl. July 19, 1967, 7 claims).

A cyclone is described with a charging chamber and separating chamber. The cleaned air stream is returned for operation of the cyclone. The invention pertains to a louver installed in the lower part which sharply deflects the air stream for the purpose of separating the finest particles. The louver may have up to 88 elements. A vibrator installed on the outer casing sets

the louver in vibration to avoid caking of the dust on the individual elements.

7684 APTIC NUMBER 19709

HYBRID DIESEL-ELECTRIC BUS MAY HELP CITIES TO LICK NOISE-AIR-POLLUTION PROBLEMS. S.A.E. (Soc. Automot. Engrs.) J., 78(8):42-45, Aug. 1970.

A hybrid diesel-electric bus is being developed by Daimler-Benz to provide quiet, exhaust-free operation in inner city traffic. For city operation, power is provided by batteries, while a diesel-generator unit produces the power to operate the traction motor when the bus is outside city center. The bus has a gross weight of 16 tons, and it can carry 66 passengers. Maximum speed is 43.5 mph, and grades of 11% can be climbed under normal driving conditions. Under the floor at the rear, the traction motor with its reduction gearbox is elastically mounted, driving the rear axle through a propeller shaft and delivering 115 kw between 1600 and 4800 rpm. This separately excited d-c motor combines the advantages of a series-wound unit with those of a shunt-wound motor. It can be continuously charged from driving operation to braking operation, when it acts as a generator to supply energy to the battery. An electronic control system processes instruction from the accelerator and brake pedals, as well as information about armature current, exciter current, and engine speed, and transmits impulses to the engine controls. The lead batteries, of which there are five, consist of 189 cells and have an operating capacity of 91 kwhr during a 5-hr discharge. A diesel-generator set consists of the 3.8-liter, 4 cycle model OM 314 diesel engine, which produces 65 hp at 2200 rpm, and a 3-phase alternator. The unit is carefully insulated to minimize vibrations and noise.

7685 APTIC NUMBER 19691

USED CAR CONTROLS HALVE EMISSIONS. S.A.E. (Soc. Automot. Engrs.) J., 78(8):36-37, Aug. 1970.

Test data are reported for retrofit emission control kits installed in cars built from 1955-1966. These kits reduce exhaust gases by eliminating or modifying vacuum spark advance, leaning idle mixture, and increasing idle speed. Spark is retarded in the systems; therefore, temperature-control devices are provided since continued operation at retarded spark can, under certain conditions, cause engine overheating. A comparison of hot-cycle emissions before and after kit installation shows that hydrocarbon emissions are reduced by 52%, carbon monoxide by 37%, and nitrogen oxides by 13%. Of 59 cars tested, the driveability of 35 remained unchanged by the kit. The driveability of 12 cars was impaired, but an equal number drove more smoothly with the kit.

7686 APTIC NUMBER 19242

Sakai, Genjiro
A PRECIPITATOR FOR DUST AND SMOKE. (Baienyo shiyinki). Text in Japanese. (Assignee not given.) Japanese Pat. Sho 44-30792. 13p., Dec. 10, 1969 (Appl. Sept. 24, 1963, claims not given).

A precipitator is described which insures that no blocking of filters takes place, completely neutralizes poisonous gases, and constantly filters and purifies water to permit its repeated use. Air separating and water cleansing chambers are provided together with an exhaust and dehydration unit in an almost completely closed housing. A filter is educated at the junction of the first two chambers. Also, a cleaner is provided which has centrifugal and wing plates, that rotate close to and parallel to the filter. The cleansing chamber has a cleaner with centrifugal and rotary plates. The cleaner sprays the solution that is constantly supplied to the chamber. Dust, smoke, and poisonous gases are absorbed by the solution in this process. Toward the bottom of the cleansing chamber, a rotary valve with two rollers is installed for squeezing out solids. The present invention can be applied for collecting extremely minute particulate matter. It is particularly suitable for blast furnace dusts and gases, which are the most difficult to handle. In the transport of coal by a slurry system, the device can be employed to separate coal particles from the carrying water, simultaneously removing the water content of the coal particles.

7687 APTIC NUMBER 19236

Samples, Randall H. and Roddy K. Street
APPARATUS FOR PURIFYING AND ACCELERATING THE FLOW OF EFFLUENT GASES IN A GASEOUS FLOW STREAM. (Commercial Fabrication and Machine Co., Inc., Mount Airy, N. C.) U. S. Pat. 3,504,898. 4p., April 7, 1970. 12 refs. (Appl. Feb. 21, 1968, 10 claims).

The improved incinerator described is provided with means for accelerating the flow of effluent gases and also with means for cooling the incinerator during combustion. The lower portion of the combustion chamber includes a vertical cylindrical wall and the upper portion, a frusto-conical wall which is attached to the cylindrical wall and which converges upwardly to a hood with a gaseous outlet opening. The outlet communicates with a conduit through which the gaseous effluent flows and where it is cooled by sprays of pressurized water. The pressurized liquid is directed downward through venturi-shape rings to accelerate the flow of oxidizable gases passing into inlet openings in the lower portion of the incinerator and through the combustion chamber, thereby facilitating combustion. Both the cooling water and the contaminant-laden liquid fall onto the babbled outer surface of the frusto-conical wall from which the combined liquids fall by gravity down the walls of the incinerator to effectively cool it during combustion.

7688 APTIC NUMBER 21663

Sandia Lab., Albuquerque, N. Mex.
CONTROL OF AIRBORNE CONTAMINATION. In: Contamination Control Handbook. NASA Order H-13245A, Section 5, 98p., 1969. 52 refs.
CFSTI: NASA SP-5076

A detailed review of the facilities, equipment, and techniques for control of airborne contamination within a controlled environmental area is presented, with accompanying tabular summaries and diagrammatic illustrations. Contaminants are classified into major groups of organic and inorganic gases and aerosols, and major sources are noted. Control techniques are discussed in terms of devices for aerosols and gases, detection and measurement, and sampling. Types and selection criteria are given for air filters to be used in contamination control facilities, with a section on high-efficiency particulate filters. Nonlaminar airflow facilities (conventional clean rooms) are described, and the advantages and disadvantages of laminar airflow facilities outlined, with detailed descriptions of horizontal and vertical laminar airflow work stations. Temperature and humidity control, construction, furniture and equipment, and personnel garments for clean rooms are considered. A review of monitoring includes air sampling and collection methods, analytical methods and instrumentation, and filter bank leak testing. Specifications for laminar airflow clean rooms are considered at length.

7689 APTIC NUMBER 19304

COUNTERMEASURE FOR LEAD NUISANCE BY AUTOMOTIVE GASOLINE. (Jidosha gasorin niyoru engai no boshitaisaku nitsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(6):383-387, June 25, 1970.

Based on an investigation of lead pollution at Ushigome Yanagicho in Tokyo, the Ministry of International Trade and Industry has announced several temporary countermeasures. The lead content of high-octane gasoline should be reduced to half by July 1, 1970, while blending with more than 1.1 ml lead/gallon, which is an average for regular gasoline, is prohibited. By these measures the total lead content of automotive gasoline will be reduced to 25%. The octane value of the high-octane gasoline will be 97, and that of the regular gasoline 90. An extensive countermeasure for automotive exhaust is under consideration. Statistics are included on the permissible concentration of lead for labor hygiene, lead content of gasoline, lead consumption in Japan, lead density in atmospheric particulates, results of physical check-ups at Ushigome Yanagicho, measurements of lead concentration in Tokyo and Osaka, lead consumption in the U. S., concentrations in the atmosphere at Cincinnati, Los Angeles, and Philadelphia, lead content in the urine of workers in battery factories, and the range of hazardous lead content for workers breathing high amounts of lead. The Ministry is working in close cooperation with the Ministry of Health and Welfare, the Ministry of Transportation, and the Police Agency.

7690 APTIC NUMBER 19237

Schoofs, Richard Joseph and Robert John Kulperger
ADSORPTION PROCESS FOR ACIDIC GASES. (Union Carbide Corp., New York, N. Y.) U. S. Pat. 3 508 382. 3p., April 28, 1970. 1 ref. (Appl. March 13, 1968, 2 claims).

The adsorptive capacity of crystalline zeolitic molecular sieves for carbon dioxide, hydrogen sulfide, carbon disulfide, and thiol mercaptans in gas streams is greatly enhanced by precontacting an activated zeolite bed with 0.1 to 10 weight percent ammonia. Preloading of the ammonia on the zeolite is accomplished by passing a stream of ammonia, alone or in combination with an inert gas, over the bed which has been preactivated by heating. The bed is then placed in the conduit of the gas stream. For adsorption, the temperature of the bed can range from -50 C to about 100 C.

7691 APTIC NUMBER 19695

Seeger, H. and W. Bruecker
KRUPP POWER SUPPLY EQUIPMENT FOR ELECTROSTATIC PRECIPITATORS. (Krupp-Spannungsspeisezanlagen zur Speisung von Elektrofiltern). Text in German. Tech. Mitt. Krupp, 28(1):11-14, April 1970. 2 refs.

Electrostatic filters require a special type of power supply to maintain their nonhomogeneous field. Operating voltage of the filter is usually 25-60 kV, sometimes almost 100 kV, and the current varies from a few milliamperes to a few amperes. The main problem is to control the voltage in such a way as to avoid a complete discharge between the electrodes. The main criterion in determining the maximum voltage is this discharge, while the most recent development in correcting elements for the power supply circuit is the use of the thyristor. Anywhere from 5 discharges per minute to 1,000 discharges per minute take place, depending on the type of filter and the type of dust. The automatic controller encompasses this entire range and regulates the circuit to the desired value.

7692 APTIC NUMBER 19272

Seiler, Rene-Rodolph
PROCEDURE FOR PURIFYING WATER TO BE USED FOR DRINKING. (Procede d'epuration d'une eau destinee a l'alimentation). Text in French. (Willy Squindo, Lausanne, Switzerland) Swiss Pat. 476,644. 3p., Sept. 30, 1969. (Appl. June 27, 1967, 11 claims).

Organic substances suspended or dissolved in a water supply can be flocculated in the amphoteric state, created by adding one or more water soluble metallic salts, which when alkalinized will form amphoteric hydrates. The water is then alkalinized by the addition of an alkaline salt derived from polytetraboric or metaboric acid. The metallic salt can be a salt of zinc or aluminum, and the alkalizer could be sodium tetraborate or sodium metaborate. After flocculation, the water can then be filtered with activated carbon and an oxidizing agent added, such as chlorine or ozone.

7693 APTIC NUMBER 19120

Semrau, Konrad
NEW EXPERIENCES WITH WET COLLECTORS. (Neuere Erkenntnisse auf dem Gebiet der Nassentstauber). Text in German. Staub, (Duesseldorf),

22(5):184-188, May 2, 1962. 33 refs.

Wet collectors may be of simple design although most are unnecessarily complicated. Their energy requirement is large when compared to electrostatic precipitators and bag filters, particularly when fine dusts are to be separated. Investment costs are generally lower than those for other collectors, but corrosion resistant material must be used when the gases to be cleaned contain large amounts of acid substances, such as sulfur dioxide. Generally, additional equipment is necessary for the recovery of the dust and water purification. The efficiency of a dust scrubber on a given dust or mist is dependent upon the power dissipated in the gas-liquid contacting process. Efficiency increases with an increase in the power dissipated, and the power dissipation required to attain a given efficiency increases as the particle size of the dust or mist decreases. However, the efficiency is nearly independent of the size, design, and geometry of the scrubber, and of the method by which the power is applied to the contacting process.

7694 APTIC NUMBER 19056

Sensenbaugh, J. D.
FORMATION AND CONTROL OF SULFUR OXIDES IN BOILERS. J. Air Pollution Control Assoc., 12(12):567-569, 591, Dec. 1962. 32 refs.

During combustion, sulfur present in commercial fuels is converted to sulfur oxides, which cause corrosion and deposit formation within the boiler and are emitted from the stacks. The flue gas concentration of sulfur dioxide is generally 0.1 to 0.25% by volume. Iron oxide on boiler surfaces and deposits containing certain ash constituents can catalyze the oxidation of SO2 to sulfur trioxide. Removal of sulfur from fuels would be the ideal solution to air pollution prevention. However, this is not possible due to economic limitations. There are a number of processes for removing SO2 from stack gases. Several scrubbing processes, such as the non-regenerative limestone process, the regenerative sodium sulfite process, and the ammoniacal liquor process have been investigated. There is also a direct ammonium sulfate process in which SO2 is catalytically oxidized and neutralized with ammonia in the scrubbing solution. Adsorption, absorption, and catalytic oxidation with metallic oxides have also been studied. Removal of SO3 from stack gases by means of additives has been accomplished in some cases. Economic justification may be provided by alleviation of corrosion and deposit formations.

7695 APTIC NUMBER 19440

Setzer, H. J., A. Kaufman, and R. F. Buswell
SULFUR REMOVAL FOR HYDROCARBON-AIR SYSTEMS. Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 21-26. 4 refs. (May 16-18.)

The most practical hydrocarbon-air fuel cell power plants are of the indirect type, in which hydrogen mixed with oxides of carbon is generated by the steam-reforming of hydrocarbons. Pure hydrogen may then be produced for the fuel cell anode using palladium/silver membrane purifiers. Unfortunately, reformer catalysts, palladium/silver purifier, and fuel cell operations are impaired when fuels containing sulfur are used. Catalytic sulfur removal appears to lend itself most readily to incorporation with the fuel cell power plant. Catalytic desulfurization in an indirect hydrocarbon-air fuel cell system utilizing a steam-reforming hydrogen generator allows the hydrodesulfurization of the fuel using hydrogen addition to the desulfurizer. Hydrogen is available in several forms from the hydrogen generator. In the system proposed, the desulfurization catalyst (a supported nickel catalyst) would be employed in the form of a replaceable cartridge which is removed from the power plant when the cartridge is spent and a new cartridge inserted in its place. The effective life of the catalyst was a function of the nature of the sulfur compounds, their concentration, the catalyst, the addition of hydrogen, and the operating conditions. A 200-hour demonstration test with a hydrogen generator utilizing JP-4 fuel with a sulfur content adjusted to 470 ppm showed no degradation in hydrogen generator performance. The hydrogen generator was protected by a nickel catalyst cartridge (exchanged at 100 hours) at 500-800 F, using dilute hydrogen recycle from the reformer as the source of hydrogen.

7696 APTIC NUMBER 19386

Sherwood, T. K.
SOLUBILITIES OF SULFUR DIOXIDE AND AMMONIA IN WATER. Ind. Eng. Chem., vol. 17:245-247, July 1925. 21 refs.

In connection with studies of absorption, a literature search was conducted for available data on the equilibrium solubilities of the industrially important gases sulfur dioxide, ammonia, and hydrogen chloride. Of these, the data on the partial vapor pressures of sulfur dioxide and ammonia over their aqueous solutions are presented in plots and tables, and the references tabulated for each.

7697 APTIC NUMBER 17637

Shigeno, Kanji
OFFENSIVE ODORS. 16. ELIMINATION OF OFFENSIVE ODOR OF FISH ENTRAILS AND BONES WITH BAMBOO LEAVES. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 3p.

Experiments were conducted to determine the effectiveness of bamboo leaves in eliminating the odor of fish entrails. Chopped up bamboo leaves were added to fresh cuttlefish entrails in amounts of 2% to 20%. After the mixture has been allowed to stand at 26 C, its odor was compared with that of an untreated sample. The odor of the untreated entrails was very bad, and increased after the first or second day, but the material containing 2%-5% bamboo leaves remained odorless. The odor was tested after boiling a mixture containing 2%-5% bamboo leaves, and no offensive odor was detected. Bamboo leaves were mixed with cuttlefish entrails which has been standing for seven days and were emitting a strong odor. After three to four days, the odor had almost disappeared. The composition of the leaf and other

factors are being studied to determine why bamboo leaves prevent the emission of bad odor.

7698 APTIC NUMBER 19003

MEMBRANE TANK SYSTEM FOR METHANE TANKERS. Shipbuilding Shipping Record, vol. 111:483-484, April 5, 1968.

A construction method for cryogenic storage tanks is described. The membrane tank consists of a thin, flexible metal lining used to contain the cargo with the load being transferred to the ships structure by means of load-bearing insulation. This type tank offers a 15% saving in capital cost and a slight reduction in operating costs. By combining methods of programming used in aeronautics with the latest knowledge obtained on the behavior of ships at sea, a series of tests was defined to which the tank was subjected. Results of the tests are discussed.

7699 APTIC NUMBER 19090

Skopp, A., J. T. Sears, and R. R. Bertrand
FLUID BED STUDIES OF THE LIMESTONE BASED FLUE GAS DESULFURIZATION PROCESS. (FINAL REPORT). Esso Research and Engineering Co., Linden, N. J., Government Research Div., Contract PH 86-67-130, GR-9-FGS-69, 113p., Aug. 1969. 28 refs.
CFSTI: PB 189495

A conceptual design of a fluidized bed flue gas desulfurization process was developed based on the ability of coarse lime particles to react with and remove sulfur dioxide from combustion flue gases in a fluidized bed. Reduction of the sulfated lime particles formed in such a process was demonstrated to provide reactivated particles, which again react with the SO2 in a flue gas to form sulfates. The effluent from reduction has a high SO2 concentration and is suitable for the production of sulfuric acid. Thus, a cyclic, regenerative flue gas desulfurization process can be envisioned that produces a saleable by-product to offset processing costs. Experiments were performed to determine and improve the reactivity of different limestone and dolomitic sorbents in a fluidized bed, and to define conditions for regeneration of the sorbents. A conceptual design of a system was formulated from these data. A coarse particle, high-gas-velocity fluidized bed operating at 1600 F was the basis of the best design. Regeneration was carried out with a producer-type gas at about 2000 F. Preliminary economics indicated that the system was not applicable in presently operating boilers but a grass-roots power plant might operate competitively. However, other general considerations, such as the large size and location of the equipment in the boiler train, make a commercial process appear unlikely in its present form. (Author abstract modified)

7700 APTIC NUMBER 19391

Smith, Paul S.
RECOVERY OF SULFUR FROM SULFUR-BEARING GASES. (DuPont de Nemours (E.I.) and Co., Wilmington, Del.) U. S. Pat. 878,568. 3p., Feb. 11, 1908. (Appl. May 25, 1907, 3 claims).

A process for recovering sulfur from kiln or smelter gases containing sulfur dioxide is described. The gases are led to a scrubber where the SO2 is absorbed by water, and the aqueous solution is heated so that SO2 is evolved in the gaseous form. It is then contacted with steam and the mixture is heated by means of producer gas. The producer gas causes the SO2 and steam to react, producing sulfur vapor which is subsequently condensed.

7701 APTIC NUMBER 19373

Snow, Robert D.
CONVERSION OF COAL SULFUR TO VOLATILE SULFUR COMPOUNDS DURING CARBONIZATION IN STREAMS OF GASES. Ind. Eng. Chem., vol. 24: 903-909, Aug. 1932. 32 refs. (Presented at the American Chemical Society Meeting, 83rd, New Orleans, La., March 28-April 1, 1932.)

Sulfur distribution during carbonization was studied to develop methods of increasing the proportion of sulfur passing into the gas; such conversion of the coal sulfur to simple volatile compounds would greatly facilitate its ultimate elimination. After a review of previous investigations, experiments are reported in which 15-gr samples of 20-40 mesh coal were heated 4 hours at various temperatures in streams of various gases. The gases and solid residues were analyzed for sulfur. Percentage sulfur eliminations obtained at 1000 C were: nitrogen, carbon dioxide, carbon monoxide, methane, and ethylene, 50 to 60; water gas, 76; anhydrous ammonia, 82; and hydrogen, 87. Steam gave 88%, and water gas with hydrochloric acid gave 72.5% sulfur elimination at 800 C. Partial removal of pyrite by oxidation and leaching, followed by carbonization in hydrogen, gave a sulfur elimination of 93%. Instantaneous carbonization in hydrogen removed 59% of the coal sulfur. (Author abstract modified)

7702 APTIC NUMBER 19062

Spaite, Paul W.
FEDERAL AIR POLLUTION PROGRAM: READY TO FINANCE MORE OUTSIDE HELP. Chem. Eng., vol. 75:170-172, Jan. 15, 1968. (Presented at the Metropolitan Engineering Council on Air Resources Meeting, New York, Oct. 23-24, 1967.)

The trend in the federal research and development program for controlling sulfur pollution is toward spending more on contracts outside the government. Research and development funds managed by the National Center for Air Pollution Control are shown in tabular form. The figures represent the federal expenditures oriented directly for sulfur oxides control. A study was conducted to determine the processes worthy of support. Three approaches were selected for the first-generation large-scale study: limestone or dolomite injection, including dry processes, and injection coupled with water scrubbers; alkalized-alumina sorption; and processes that would treat pyrite-coal mixtures derived from deep cleaning of coal to produce heat, sulfur, and

sulfuric acid. The program for developing new processes is aimed at providing second-generation processes for removing sulfur dioxide from flue gases arising from the combustion of fossil fuels. Two types of contracts are being negotiated. One will be devoted to through, broad surveys of available technology in nine areas: aqueous solution, dry metal oxide sorption, direct reduction to sulfur, inorganic liquids and solids, organic liquids and solids, catalytic oxidation, and physical separation. The second contract calls for unsolicited proposals. To encourage more extensive control of such sources as primary smelters, pulp and paper mills, sulfuric acid plants, and coke plants, a series of studies on cooperative research and development are planned.

7703 APTIC NUMBER 21960

Spalding, C. W. and S. T. Han
ABSORPTION WITH CHEMICAL REACTION FROM A DILUTE GAS IN PACKED TOWERS. TAPPI, 45(3):192-199, March 1962. 28 refs. (Presented at the Engineering Conference of the Technical Association of the Pulp and Paper Industry, 16th, Washington, D. C., Oct. 16-19, 1961.)

The absorption of a dilute component of a gaseous mixture by chemical reaction in a liquid is reviewed on the basis of both the film and the penetration theories. The design procedure and operating characteristics of packed towers are discussed in the light of the theories and illustrated with the sulfur dioxide-water and sulfur dioxide-sodium hydroxide-water systems. The fundamentals of interphase mass transfer are reviewed. Concern over air pollution and chemical costs has led the pulping industry to consider the removal of many compounds from exhaust gases. (Author abstract modified)

7704 APTIC NUMBER 21872

THE 'OPTIMOMETER' - A DEVICE FOR AUTOMATIC CONTROL OF SMOKE EMISSION. Steam Heating Eng. (London), vol. 39:30-33, March 1970.

The 'Optimometer' monitors stack conditions and automatically adjusts burner air/fuel ratio to hold smoke emission at a predetermined level. In its present form, it is suitable for use on boilers fired by a single oil burner with fd or id fan. The device is essentially a servomechanism interposed between the oil and air supply controls, the error signal required being derived from photocell equipment in the exhaust flue from the boiler. It replaces the conventional linkage between oil valve and air damper, allowing the oil/air ratio to be trimmed as required. The equipment is supplementary to conventional controls, and is designed to allow the burner/fan control system to operate conventionally in case of failure of the smoke sensing equipment. The Optimometer maintains a smoke number of 4-5 in the stack, corresponding to operation at obscuration of approximately 3% and a smoke color between Ringelmann 0 and 1.

7705 APTIC NUMBER 21762

Steinhagen, William H.
AIR POLLUTION CONTROL METHODS FOR THE GASOLINE POWERED INTERNAL COMBUSTION ENGINE. General Motors Corp., Detroit, Mich., 29p., 1967. 36 refs. (Presented to the Panel on Electrically Powered Vehicles, Office of the Secretary, Dept. of Commerce, Feb. 18, 1967.)

Three sources of emission are identified for the internal combustion engine: crankcase emissions, evaporation losses, and exhaust emissions. It is claimed that crankcase emissions are of academic interest since this source of emission has been completely controlled by positive crankcase ventilation techniques. Evaporation losses are identified as originating in the automobile's fuel tank and carburetor. Control appears to be technically feasible, but the present progress in this field is limited to checking procedures for measuring these losses. The approach to control showing the most promise is the adsorption-regeneration technique, but no production hardware is yet designed. Several exhaust control systems are in the development and/or field test stage. Air injection reaction (AIR), controlled combustion system, and catalytic reactors are but a few. The first of these operates by injecting air into the exhaust manifold to more completely burn hydrocarbons and to oxidize CO to CO2. The second utilizes heated carburetor air to permit operation on a leaner fuel mixture, thereby reducing the concentration of all pollutants in the exhaust gas. The principle drawback to using catalytic exhaust manifolds is that the catalyst is rapidly fouled by the lead in the gasoline. Brief mention is made of the control of the lead content of gasoline as being beneficial in the control of automotive emissions.

7706 APTIC NUMBER 21928

Stenhouse, J. I. T., J. A. Harrop, and D. C. Freshwater
THE MECHANISMS OF PARTICLE CAPTURE IN GAS FILTERS. Aerosol Sci., 1(1):41-52, 1970. 35 refs.

The results of tests on the efficiency of aerosol filtration using model filters of known geometry are presented. The sodium flare method is used to determine the filtration efficiency; a spinning top aerosol generator is incorporated to provide monodispersed particles of sodium chloride. The model filters are constructed from a series of grids of parallel wires. A theory based on the Happel cellular flow model is described which predicts the inertial efficiency in packed filters. The results in the inertial region of filtration are compared with existing theories. Electrostatic effect have significant effect on efficiency at low velocities. (Author abstract modified)

7707 APTIC NUMBER 21720

Stone and Webster Engineering Corp., Boston, Mass.
SULFUR DIOXIDE SCRUBBERS. STONE AND WEBSTER IONICS PROCESS. (FINAL REPORT). NAPCA Contract CPA 22-69-80, 22p., Jan. 1970. 34 refs.
CFSTI: PB 189377

A study was conducted to determine the most economical scrubber for the removal of sulfur dioxide from flue gas produced by a coal burning power plant. The scrubber would be specifically designed to operate as part of a system using the Stone and Webster/Ionics SO2 removal process. This process includes an SO2 scrubber where SO2 is absorbed in a sodium hydroxide solution to form a sodium sulfite/bisulfite solution which is sent to a neutralization stage. An attempt was made to select equipment which would achieve 90% SO2 removal. Since no supporting data were supplied, at least two actual contact stages are provided in all cases. The efficiency of SO2 absorption and the amount of oxidation that occurs in the six scrubbers tested are discussed. An economic comparison of various scrubbers is also included. The Johnson packed tower appears to be the most economical scrubber; all other units are considerably more expensive than the Johnson Unit. Until manufacturers of venturi, cyclonic, and floating ball scrubbers can produce very large single units, their evaluated cost makes the use of such units in the Stone and Webster/Ionics process impractical.

7708 APTIC NUMBER 19153

Strack, William C.
CONDENSERS AND BOILERS FOR STEAM-POWERED CARS: A PARAMETRIC ANALYSIS OF THEIR SIZE, WEIGHT, AND REQUIRED FAN POWER. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TN D-5813, 64p., May 1970. 27 refs.

Size, weight, and performance of conventional condensers and boilers for steam-powered cars are analytically investigated. Fan power is presented over a range of design and operating variables such as heat-exchanger size, heating rate, and ambient air temperature. Practical condensers are about four or five times the size of conventional automobile radiators. Boiler size is not necessarily large; 100-lb (45-kg) boilers are possible for 4000-lb (1815-kg) passenger cars. The weight and fuel economy of a complete propulsion system are estimated to be quite comparable of today's internal-combustion systems.

7709 APTIC NUMBER 19038

Strimbeck, Donald C., Arthur J. Liberatore, Gerald B. Goff, and James P. McGee
BUREAU OF MINES COAL-FIRED GAS TURBINE RESEARCH PROJECT. TEST OF COMBUSTOR AND ASH SEPARATORS FOR OPEN-CYCLE PLANT. Bureau of Mines, Washington, D. C., Dept. of Investigations 7295, 12p., Sept. 1969. 2 refs.
CFSTI: PB 187742

A down-fired combustor lined with refractory brick proved to be an efficient means for burning pulverized coal in an experimental open-cycle gas turbine. Efficiency of the combustor was 95 to 99+ % (compared with 85-90% for the previously used flame-tube combustors) as a result of better mixing of air and coal in the combustion zone, longer retention time of coal in the burning zone, and lower heat loss. Relatively little unburned carbon remained in the ash, thereby reducing the mass load of solids requiring removal; 20% of the particles were removed from the washout chamber at the bottom of the combustor. The axial-flow separator operating as a single stage adequately met design specifications calling for low pressure drop and little gas blowdown loss, while ash load in gas from the axial-flow separator was about 24 grains/100 scf. Although the objective of improving the ash separation was not achieved, the experience indicated that an ash concentration around 1 grain/100 scf might prove acceptable. (Author conclusions modified)

7710 APTIC NUMBER 19692

Supp, A., J. Hartwig, and W. Schnuerpel
DESULFURIZATION OF SOFT COAL, ESPECIALLY COAL WASHINGS. (Entschwefelung von Steinkohle, insbesondere von Kohlenschlaemmen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:412-417, 1970. 2 refs.

Research originated by the bituminous coal industry has indicated the practicality of reducing the sulfur content of coal mined in the Ruhr by an average of 40-60%. Extensive experimentation was also conducted with the use of a coal-water suspension as a fuel for use in power plants. This has increased interest in the desulfurization of such suspensions. A device for mechanically desulfurizing a suspension of particles containing pyrite consists of a combination of a stirring mechanism and 'cage' made up of hollowed-out rings. This element is rotated at a predetermined speed, which causes particles with the specific gravity of pyrite to be selectively precipitated from the suspension. A pilot plant making use of this principle has a throughput rate of 8 tons per hour for a turbidity of 500 grams per liter and of 12 tons per hour for a turbidity of 750 grams per liter. It uses an electrical input of 60 kW. Results of testing show the possibility of a 40-60% sulfur removal, combined with a 20-40% separation of sulfur-bearing ash. A certain amount of good coal is lost in the process, 5-7% wt. By using a two-stage desulfurization process, it is possible to diminish this loss to less than 1%. It is even possible, by further purification, to obtain a commercial pyrite concentrate, the yield varying between 77 and 90% wt. Best results are obtained with a grain size 40-100 microns. The operating cost of this process has been estimated at approximately $.40 per ton.

7711 APTIC NUMBER 19303

Suzuki, Teruaki
OPERATIONAL FUNCTION AND APPLICATION OF PULSE AIR COLLECTOR. (Parusu ea korekuta no kiko to tekiyo nitsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):466-470, June 15, 1970. 4 refs.

The pulse air collector is a bag-filter of the continuous, automatic cleaning type. It was developed by the Pulverizing Machinery Division of the Slick Corporation (USA), and has been manufactured by Hosokawa Engineering Co. since 1962. The collector consists of housing for the felt filter, top plenum, and hopper. Air or gas which is dust-laden is pulled in from the bottom, passes the cylindrical filters from outside into inside,

goes through a venturi region, and is discharged from the top exit. The dust in the air is filtered by the felt and remains on its outside. The felt cylinders end with a venturi tube which opens to a blow tube. High-pressure air of 7 kg/sq cm is ejected for 0.1 sec from the blow tube. The air sucks surrounding air at the venturi apparatus and gives an impulsive pressure to the felt filter. The dust on the outside surface of the filter is removed by the air pulse. The efficiency of dust collection was above 99.5% when tested at a factory. Besides removing dust from air for the prevention of public nuisance, the device has an application to the collection of products. It was applied to the removal of white fume from a molten zinc plating process, which has 97-98% submicron particles including 0.4 micron size. A collection efficiency of 99.5% was achieved. High efficiency and stable operation are other features of the collector.

7712 APTIC NUMBER 19267

(Inventor not given.)
METHOD FOR THE REMOVAL OF OIL SLICKS FROM SURFACES, PARTICULARLY WATER SURFACES. (Verfahren zur Beseitigung von auf Oberflaechen, insbesondere Wasseroberflaechen, befindlichen Oelschichten). Text in German. (Paul Seger, Hamburg, West Germany Swiss Pat. 476,849. 3p., Aug. 15, 1969. (Appl. Jan. 4, 1965, 12 claims).

A method was devised for removing oil slicks from water surfaces by strewing one or more organic substances over the slick which, by their physical structure or chemical properties, are capable of binding the oil. Moisture repellent, organic, oil insoluble polymers are used which continue to float when loaded with the oil. Ground, vulcanized natural rubber and/or synthetic rubber and/or small flakes of urea-formaldehyde-condensate and/or polystyrol are used. The polymers are mixed several percent by weight with water repellents such as aluminum or calcium stearate. The oil-laden polymers are removed from the water surface by nets. They are then mixed with oil absorbing or adsorbing substances such as aluminum silicates. Next, cement of pulverized gipsum is added for binding the water. All substances mixed to the oil-laden polymers are mixed with a water repellent and with kollophonium for resinification. For example, 100 kg finely ground, vulcanized rubber is mixed with 5 kg fine ure -formaldehyde flakes and 1 kg aluminum stearate. The mixture is strewn over the oil slick where it is capable of binding 2 to 5 times its weight of oil. The oil-laden binding material is then mixed with an oil fixer consisting of 50 kg pulverized aluminum silicate, 1 kg aluminum stearate, 40 kg pulverized cement, 1 kg pulverized stearic acid, 10 kg pulverized gipsum, and kollophonium. A crumbly rubber mass is obtained which leaves no oil traces.

7713 APTIC NUMBER 19465

Szombathy, Koloman von
PROCESS FOR PRODUCING PURE SULPHUR FROM CRUDE MATERIALS CONTAINING SULPHUR IN AN UNINTERRUPTED OPERATION. (Assignee not given.) U. S. Pat. 1,936,959. 3p., Nov. 28, 1933. (Appl. June 26, 1930, 4 claims).

The sulfur content of the crude material is converted by conventional means into hydrogen sulfide and sulfur dioxide; these gases are then simultaneously led into a polythionate solution, also containing small amounts of alcohols to accelerate the process, as a washing fluid. Liberated sulfur is separated from the salt solution and dried, while the salt solution freed from the precipitated sulfur is regenerated and constantly returned to the reaction vessel for the further production of sulfur. At least twice as much H2S as SO2 is utilized and the solution is maintained at a temperature of 45-65 C in a continuous closed cycle. The method is chiefly applicable for producing large quantities of sulfur from crude materials capable of being easily gasified, such as sulfur ores, pyrites, sulfide of zinc, copper pyrites, sulfide of lead, and crude sulfur. Potassium salts are best adapted for preparing a pentathionate solution.

7714 APTIC NUMBER 19244

Takahashi, Satoru
AN EXHAUST-GAS PURIFIER FOR AN INTERNAL COMBUSTION ENGINE. (Nainenkikan haikigasu jokasochi). Text in Japanese. (Suzuki Automotive Industries (Japan)) Japanese Pat. Sho 45-4481. 4p., Feb. 14, 1970. (Appl. Feb. 22, 1963, claims not given).

The present invention is a modified Cottrell precipitator for use with a movable vehicle or a small engine. A cylinder is attached to the exit of the exhaust pipe forming a silencer with a number of electrically insulated electrodes. Petal-formed discharge plates are connected to the electrodes. A dc power source is provided to apply high voltage between the cylinder and the electrode. Purifying of the exhaust gas is performed step-wise, that is, particles missed by a discharge plate are caught by the succeeding plates. Since the discharge takes place close to the innerwall of the cylinder, a narrow gap between the discharge plates is allowed, making the total length of the device short. The electrodes and insulators are covered by a protecting plate which prevents malfunction of the discharge or leaks. Moreover, to increase purification effeciency a conical antielectrode is provided, which matches the exhaust-gas velocity. The electrodes, insulators, and protecting plates are fixed to the cover of the cylinder, facilitating maintenance. The power consumption for the discharge is small; it is the same order as that needed for one headlight. The present device is particularly suited for use for 2-cycle or diesel engines.

7715 APTIC NUMBER 19820

Takaoka, Hideo, Koichiro Iijima, Yukio Shibata, and Satoru Itoh
STEAMING OF HYDRODESULFURIZATION CATALYSTS. (Suisokadatsuryushokubai no suchimu shori). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Institute, Tokyo), 13(6): 442-447, June 25, 1970. 6 refs.

The effects of steam-aging on the activity and the physical properties of commercial hydrodesulfurization catalysts such as CoMo-alumina, NiCoMo-alumina, and NiMo-alumina used in petrochemical industries were investigated. The catalysts were

subjected to coke-burning regeneration in commercial units by means of a 200 cc autoclave under the conditions of 1-21 kg/sq cm-absolute and 400-600 C. The process caused a marked drop in the surface area, the micro-pore volume and the side crushing strength, but only a slight decline in the catalytic activity was observed. The amount of coke deposited on the catalysts was less for steam-aged catalysts having smaller micro-pore volumes. It was concluded that the effects of steaming may be much larger on the mechanical strength than on the catalytic activity when the catalysts are regenerated in commercial units.

7716 APTIC NUMBER 17636

Takeda, Minoru, Osamu Koyama, and Tatsukichi Ishiguro
OFFENSIVE ODORS. 15. PRESENT SITUATION IN TOKYO WITH RESPECT TO OFFENSIVE ODOR CONTROL MEASURES. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 4p.

The problems connected with fish refuse collected in and around Tokyo include the following: method of collection and transportation; contamination; lack of uniformity; and fluctuations in the quantity to be handled. These factors have delayed the development of proper and efficient procedures for refuse handling. The factories in Tokyo are not modernized in their processing methods. The raw materials are boiled in flat kilns, compressed by a hydraulic press, and the oil is collected. Therefore, the process was modified by using a 'cooker', by having the press and drying processes done with closed-type equipment, and by using a deodorizing device. Thus, by reducing the number of odor sources within the plant one by one, some progress in eliminating the offensive odor was made. Improvement of the present manufacturing processes is being made by using gas chromatography and other methods to investigate the constituents of offensive odors evolved from the present treatment process.

7717 APTIC NUMBER 19592

Takeuchi, Tsugio and Tamotsu Tanaka
DRY REMOVAL PROCESS OF SULFUR COMPOUNDS IN EXHAUST STACKS. Translated from Japanese. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 3p., Oct. 29, 1969.

The ability of activated charcoal to remove sulfur dioxide from exhaust gas in the form of sulfuric acid was tested by passing the treated gas through a hydrogen peroxide solution and titrating by alkali the H_2SO_4 that was produced in the solution. The amount of sulfur dioxide entrained by the charcoal varied greatly with the linear velocity of the gas and with space velocity. In addition, activated charcoal wetted with ammonium sulfate captured about three times as much sulfur dioxide as the original activated charcoal. Presumably, the sulfuric acid produced on the charcoal reacts with ammonium sulfate to yield ammonium hydrosulfate and to free sulfuric acid not produced on the charcoal. The experiments demonstrate that ammonium sulfate can be used to regenerate the activated carbon and that crystallized ammonium sulfate can be easily recovered as a by-product.

7718 APTIC NUMBER 17635

Taman, Shuku, Hiroshi Muranaka, Tadabumi Tsuchida, and Hiroshi Ikeda
OFFENSIVE ODORS. 14. CHEMICAL PLANT COUNTERMEASURES IN OSAKA PREFECTURE. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 5p.

The progress of the Nishinari Health Center in promoting measures to control offensive odors from chemical plants is discussed. The area concerned is one of private houses and factories. It contains eight chemical plants: six manufacturing bone meal, oil, and fat; one, fish meal; and one, blood meal. In bone meal plants, the bones, horns, and hooves of cattle, hogs, and other animals are boiled to obtain oils, fats, and glue. The sources of odor are the exhaust fumes from the steam boiler, the glue kiln, and the exsiccation furnace. In fish meal chemical plants, the steam boiler and exsiccation furnace exhaust fumes are the sources of odor. In blood meal plants, the blood is boiled by steam to be changed into blood meal. The exhaust fumes of this steam are the odor sources. Deodorization experiments with resin were successful, but due to technical and economical problems could not be put into practice. Deodorization by adsorption was not very effective. In another experiment, the exhaust gas was cooled in a water tower and passed through an absorption vat where it was mixed with a solution of NaOH and NaClO. It was then passed through a solution of oxalic acid. This method proved to be very successful. A Committee for Solving the Chemical Plant Problem was formed to promote experimental research in deodorization methods, secure funds, and aid in construction.

7719 APTIC NUMBER 19221

Tarala, Frederick P.
FILTER. (Dollinger Corp., Rochester, N. Y.) U. S. Pat. 3,513,643. 3p., May 26, 1970. 17 refs. (Appl. May 21, 1968, 2 claims).

A corrugated, porous air filter is described. The filter is a fiber glass layer secured between a relatively stiff, thermosetting layer, which resiliently retains the corrugations in place, and a pourous charcoal filter paper for removing odors from air passed through the filter. Electrical air filtering systems are expensive to manufacture and maintain. Previous mechanical systems were not efficient in removing dust, pollen, and other air-borne particulates. The filter described combines the better qualities of both electrostatic and mechanical type air filters. It can be readily assembled in a preformed housing.

7720 APTIC NUMBER 21795

Teworte, W.
REDUCTION OF EMISSIONS IN METAL FOUNDRIES AND REFINISHING PLANTS. (Emissionsverminderung in Metallhuetten und Umschmelzwerken). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:260-273,

the precipitator is used for such plants with two separate rapping devices for the primary and secondary dust collection zones. The most favorable rapping rhythm must be experimentally determined in each individual case.

7725 APTIC NUMBER 19216

Tomogawa, T. and Masahiko Asai
O-K TYPE SCRUBBER FOR SODA RECOVERY BOILER. (Soda kaishu boira yo O-K gata sukuraba ni tsuite). Text in Japanese. Kami-Pa Gikyoshi (Journal of the Japanese Technical Association of the Pulp and Paper Industry), 24(7):366-368, July 1, 1970.

The O-K type scrubber was developed for treating the exhaust gas from the soda recovery boiler. The quantity of falling dust can be reduced by collecting the larger dust in the exhaust gas. Therefore, a model plant of a cyclone scrubber was constructed which has a comparatively simple structure. Its performance was examined for about 8 months. On the basis of the data, a practical O-K-I type scrubber was constructed, and it attained the desired effect. Exhaust gas passes from the electrical dust collector to the O-K-I type scrubber and dust is removed by a cyclone effect after it is collected by water drops. About half of the black liquor is water and steam in the exhaust gas and contains a large quantity of latent heat. To use the heat sufficiently, the gas temperature must be lower than the dew point, about 70 degrees. However, due to a technical problem, the temperature of the tail gas is usually about 150 degrees. By using the scrubber, the temperature of the tail gas is lowered to 60 degrees.

7726 APTIC NUMBER 19644

Tsudo, Kozaburo
OPERATION OF SO2 GAS ABSORBING PLANT. Nippon Kokan Giho (Tokyo), 19(1):1-6, 1966. Translated from Japanese Belcv and Associates, Denver, Colo., 19p., April 21, 1970.

A method for controlling sulfur emissions from a sulfuric acid plant is described. This method is a limestone-gypsum injection where the sulfurous acid gas and sulfur dioxide are neutralized, and the gypsum is recovered. Lime milk is sprayed into an elimination tower where the SO2 and acid are absorbed. The solution containing SO2 is sent to a pH tower where it is regulated to a suitable pH by an acidification reaction. Calcium sulfite, formed in the elimination tower, is sent to an acid tower. Here it is acidified to calcium sulfate to form gypsum by minute mist. The gypsum is transported to a gypsum thickener where it is separated, washed, and deliquidated. The operation and production data of this system are also included.

7727 APTIC NUMBER 19296

Tsuji, S., Etsuji Kato, and Tokuji Tijima
AN APPARATUS FOR DESULFURIZATION OF FLUE GAS. (Haigasu chuno iosankabutsu datsuryusochi). Text in Japanese. (Hitachi Manufacturing Co., (Japan)) Japanese Pat. Sho 45-6121. 3p., March 2, 1970. (Appl. Aug. 15, 1966, claims not given).

Contact between a desulfurizing agent and flue gas is improved by placing a number of thin box-type electrodes filled with the desulfurizing agent between two rows of porous plates. The flue gas flows parallel to these electrodes. A discharge electrode is placed in the middle of the adjacent box-type electrodes. High electric voltage is applied between the discharge and desulfurization electrodes. Ion flow generated between the electrodes comes in contact with the desulfurizing agent. Particulates in the flue gas are electrostatically collected by a porous plate or screen, while sulfur oxides in the flue gas pass through the porous plate or screen and run into the desulfurizing agent. The main feature of the present device is thus the utilization of the combined effect of electrostatic precipitation and gas adsorption or absorption. In a test, granules of limestone (5-10 mm) were employed as the absorbent and flue gas at 140 C with 0.2% SO2 and SO3 was led through the device. With an applied voltage of 10-60 kv, a desulfurization efficiency of 50-70% was achieved. Those particulates which stuck to the screen, and also the sulfate and sulfite chemically formed on the surface of the limestone granules, were removed by a hammer. A zig-zag arrangement of the discharge electrodes is another feature of the present device.

7728 APTIC NUMBER 20796

Turk, Amos
INDUSTRIAL ODOR CONTROL. Chem. Eng. Deskbook, 77(9):199-206, April 27, 1970. 13 refs.

Accepted methods of odor control are examined with special emphasis on what can go wrong in the methods themselves or in assumptions of the degree of control thought to be necessary. Odors are extremely difficult to measure, and it is equally difficult to decide what levels are accepted. Distance from a source at which odor may be detected is not predicted even approximately from dilution ratios and dispersion calculations. Meteorological dispersion formulae give little help in estimating the ratio of peak to mean concentration, since the parameters they incorporate are to a large extent empirical and are well established only for prolonged release and average plumes. Particles may contribute to odor if they are volatile, if they release adsorbed odorous vapors, or they are indeed odorous in themselves. Thus, if a single particle carries odor, it constitutes transport with dilution. Complete oxidation of odorous vapors eliminates their odors, but when oxidation is incomplete, the odor quality may actually get worse before it gets better. Catalyst deterioration, selection of temperature and residence time, and comparison with solvent recovery are some of the main problems in air oxidation to which the engineer should be alert. Other oxidizing agents used for deodorization include ozone, chlorine, chlorine dioxide, hypochlorites and permanganates, but the question of odors of intermediates may be critical. Activated carbon is the only practical adsorbent that can be used for odor control because its performance is not weakened by the presence of moisture, but there are problems of catalytic action, rapid saturation from spills and vapor surges, and special reactivation methods. The vapor screen or neutralization concept consists of

interposing a vertical wall of odor-neutralizing vapor between the odor source and the sensitive noses of neighborhood residents. Washing and scrubbing, counteraction and masking are also considered.

7729 APTIC NUMBER 19475

Tyrer, Daniel
PRODUCTION OF SULPHUR. (Imperial Chemical Industries Ltd., London (England)) U. S. Pat. 1,936,809. 1p., Nov. 28, 1933. (Appl. June 19, 1931, 2 claims).

The production of sulfur by reducing sulfur dioxide with carbon at a high temperature is described. An SO2 gas containing no oxygen or an amount insufficient to maintain the necessary reaction temperature is passed through a bed of coal. Coal may be supplied to the top of a fuel bed whose lower portions are maintained at a temperature of 100-1200 C by the introduction of air. Hot SO2 is admitted at the top and passes downward through the bed, carbonizing the coal. The gaseous products are then passed through a heated zone near the air supply where the reduction of SO2 is completed. The temperature of the inlet gas should be at least 400-500 C. If the gases leaving the fuel bed contain an excess of carbon monoxide, it may be utilized by adding more SO2 which causes a secondary reaction. In general, the gaseous reaction products will also contain small amounts of hydrogen sulfide, which may be eliminated by mixing the gaseous products with the requisite amount of sulfur dioxide.

7730 APTIC NUMBER 19138

Urban, Peter and Lester G. Massey
PROCESS FOR THE RECOVERY OF CRYSTALLINE SULFUR. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,099,536. 4p., July 30, 1963. 6 refs. (Appl. July 5, 1960, 6 claims).

A process for recovering substantially pure sulfur from a gas stream containing hydrogen sulfide or mercaptans is described. The process provides a simple, liquid phase, low temperature, non-catalytic process which results in large conversions of hydrogen sulfide to substantially pure sulfur. It involves absorbing sulfur dioxide and hydrogen sulfide in a solvent comprising an alcohol, and having from about 0.5% to about 40% by volume of water dissolved therein, forming sulfur, and separating the sulfur from the solvent. Previous processes involve high temperatures, special catalytic agents, and are generally more expensive and difficult to maintain.

7731 APTIC NUMBER 19422

Urban, Peter and William K. T. Gleim
PRODUCTION OF SULFUR. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 2,998,304. 6p., Aug. 29, 1961. 6 refs. (Appl. Dec. 8, 1958, 8 claims).

A method is described for removing hydrogen sulfide from a gas stream and for producing sulfur by providing a simple liquid phase low temperature process for large conversions of H2S to substantially pure sulfur at relatively low cost. Sulfur dioxide and H2S are absorbed in a water-saturated hydrocarbon solvent and reacted in the presence of a detergent and in contact with the solvent and a sufficient excess of additional free water to form a hydrocarbon solvent phase and an aqueous sulfur-containing phase. The detergent must be soluble in at least one of these phases and present in sufficient amount to prevent agglomeration of sulfur. The resultant reaction mixture is separated into a hydrocarbon solvent layer and an aqueous sulfur-containing layer; sulfur is recovered from the latter. The solvent is a kerosene distillate, or other hydrocarbon distillate boiling in the approximate range of 375-600 F. Examples of possible detergents are an aralkyl sulfonate, a tertiary acetylenic glycol, and a quaternary ammonium halide.

7732 APTIC NUMBER 19427

Urban, Peter and Lester G. Massey
PRODUCTION OF SULFUR. (Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,050,370. 4p., Aug. 21, 1962. 2 refs. (Appl. July 5, 1960, 6 claims).

A simple, liquid phase, low temperature, non-catalytic process which results in large conversions of hydrogen sulfide from industrial gas streams to substantially pure sulfur is described. The process comprises absorbing sulfur dioxide and hydrogen sulfide in a solvent of one of several possible substances (an ester, methyl acetate, ethyl acetate, methyl propionate, ethyl propionate, or propyl acetate), and having from about 0.5 to about 40% by volume of water dissolved in the mix. The sulfur dioxide and hydrogen sulfide react with the solvent to form and separate sulfur from it.

7733 APTIC NUMBER 19053

Varlamov, M. L., Ya. I. Starosel'skii, and G. A. Manakin
STABILITY OF AMMONIUM NITRITE AT LOW CONCENTRATIONS IN THE FORM OF AN AQUEOUS AEROSOL IN ELECTROSTATIC PRECIPITATORS. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 41(1):42-45, Jan. 1968. 9 refs.

An investigation was conducted to test the stability of ammonium nitrite in aqueous aerosol form in an electrostatic precipitator under the conditions of the ammonia process for purifying waste gases from a nitrose system. A schematic diagram of the laboratory apparatus is included. The mixture entering the precipitator contained nitric oxide, nitrogen dioxide, ammonia, and ammonium nitrite and nitrate. The gas leaving it contained a small amount of unconverted oxides, and residual ammonium nitrite and nitrate. Gas samples were taken at equal time intervals into six pairs of bottles to which 100 ml of distilled water was added. The samples were kept for 24 hours to complete the oxidation of nitric oxide and to allow absorption and condensation of the compounds formed. The total amount of nitrogen compounds entering the precipitator was 28.03 g, and the total output was 27.06 g; therefore, the discrepancy was 0.97 g, or

3.54% of the total. It was concluded that no substantial decomposition of ammonium nitrite occurs in the high-voltage field during the residence time of the gas in an electrostatic precipitator.

7734 APTIC NUMBER 19403

VDF (Verein Deutscher Eisenhuettenleute), Duesseldorf, Germany
DUST EMISSION CONTROL, STEEL WORKS (BROWN SMOKE) OXIGEN-BLOWN STEEL PROCESSES, CONVERTER. (Staubauswurfbegrenzung Stahlwerksbetrieb (Brauner Rauch) Sauerstoffaufblasverfahren, Konverter). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2112, June 1966, 36 refs. Translated from German by H. Schneider, Isreal Program for Scientific Translations, Jerusalem, 12p.
CFSTI: TT 68-50469/6

The advantages of using oxygen for steel production have led to the development of a number of new metallurgical processes, one of the most important being the oxygen converter process wherein oxygen is blown on a metal bath that is charged into the converter from a blast furnace or cupola. Dust in converter gases is generally known as 'brown smoke'; it consists mainly of vaporized iron oxides and manganese oxides, as well as vaporized slag components. Measures to be applied during the blowing period in the converter and designed to reduce the emissions of brown smoke by modification of charge compositions or converter operation are unfeasible with one exception. To keep dust emissions within desirable limits, converter waste gases must be cleaned. Three collectors discussed are filters, electrostatic precipitators, and wet scrubbers. The operating factors influencing the separation efficiencies of these methods are noted. To be suitable for the process, the collectors should have an efficiency of 98%. It is further recommended that each converter be provided with its own waste gas stack from which gases are led by a cooling unit to the collector. Oxygen-blown converter plants should also be equipped with stack flares to insure the ignition of CO-containing waste gases.

7735 APTIC NUMBER 19341

Vetter, H.
MAINTENANCE OF CLEAN AIR. (Luftreinhaltung). Text in German. Energie (Munich), 20(5):127-129, May 1968. 37 refs.

In cooperation with numerous industries, the West German government succeeded in reducing the overall industrial emissions. Emissions by domestic heaters were also successfully stemmed, while no great progress has been made in reducing emissions from automobiles. Extensive measurements have been taken in Munich, and in the Ruhr Valley such a measurement program is presently underway. All air quality measurements indicate a downward trend for atmospheric dust and sulfur dioxide concentrations. The method and equipment used for air quality measurements is still subject to wide discussions. Loebner-Liesegang units seem to be most reliable, while Bergerhoff units produce results which fluctuate within a wide range. As far as dust collection in power plants is concerned, electrostatic precipitators still predominate. A tendency toward the increasing use of 10 to 12 m high collection electrodes is seen to improve the collection efficiency. Injection of sulfur trioxide into the flue gas has likewise been found to improve the collection efficiency without requiring higher collection electrodes. Desulfurization processes are being developed in the U. S., Japan, and West Germany. The question has been raised whether the toxicity of SO2 is not being over-emphasized and whether it would not be better to concentrate efforts on other more dangerous pollutants. The Federal Government of West Germany has introduced a resolution making air pollution a federal task rather than one concerning the individual states.

7736 APTIC NUMBER 19070

Viles, Prentiss S.
CONVERSION OF METHANE TO PRODUCE HYDROGEN SULFIDE. (Esso Research and Engineering Co., Elizabeth, N. J.) U. S. Pat. 2,887,363. 2p., May 19, 1959. 4 refs. (Appl. Sept. 28, 1956, 4 claims).

A process is described for producing hydrogen sulfide by the reaction of methane with sulfur dioxide in the presence of the catalyst cobalt molybdate. The methane is in stoichiometric excess. Reaction temperature may be between 800 and 1600 F with the preferred range from 1100 to 1300 F. Reaction pressure may vary from zero absolute to 1000 psig; low pressures in the range of one atmosphere are most desirable. The cobalt molybdate catalyst consists of a mixture of cobaltous oxide and molybdic trioxide in a mol to mol ratio. Preferred supports for the catalyst are purified aluminas. Feed rate for the methane-sulfur dioxide mixture is nominally 50-100 volumes of feed per volume of catalyst per hour. Sulfur dioxide is substantially completely converted to hydrogen sulfide and a small amount of carbon monoxide is obtained. A trace of water may also result and the excess methane may be converted in part to hydrogen. The process is claimed to have utility in the conversion of the sulfur dioxide in industrial flue gases and in the effluent from the roasting, sintering, and smelting of sulfide ores to a marketable product, hydrogen sulfide.

7737 APTIC NUMBER 19412

Vogel, Heinrich
PROCESS FOR THE PRODUCTION OF COLLOIDAL SULPHUR. (Assignee not given.) U. S. Pat. 1,546,048. 1p., July 14, 1925. (Appl. June 1, 1923, 6 claims).

A process is described for the production of highly dispersed colloidal sulfur solutions, in which sulfur dioxide and an excess of sulfuretted hydrogen in a state of the finest possible division are simultaneously introduced into water mixed with a protective colloid in a reaction vessel cooled to from -3 to plus 4 C. To avoid oxidation of the finished solution, it should be stored saturated with sulfuretted hydrogen in closed receptacles.

7738 APTIC NUMBER 19830

Waid, Donald E.
AIR POLLUTION CONTROL THROUGH THERMAL INCINERATION OF ORGANIC

FINISHING FUMES. Ind. Finishing (Indianapolis), 46(6):32-36, June 1970.

Most installations for air pollution control in industrial finishing plants have been of the direct gas flame thermal incineration type. As the required standards on control of organic combustibles have been raised, the trend to thermal incineration have been accelerated. The Los Angeles Air Pollution Control District requires the elimination or complete oxidation of the carbonaceous material in an effluent that may enter into the smog reaction. To oxidize carbon dioxide, temperatures of 1200 to 1400 F are required, depending on design variables and the initial concentration of hydrocarbons entering the incinerator. Either a tunnel-type burner or a line-type in-the-duct burner may be used. There are several advantages to the in-the-duct burner. Fuel economy is realized when it is possible to use oxygen from the warm effluent for combustion. Uniform heating of the effluent can be obtained, and 100% of the combustion chamber can be used for dwell time when a short flame line burner is used. When 16% O2 or more is available in the effluent, a high temperature burner may be supplied with gas only and take the O2 supply from the effluent. Some of the advantages of the thermal process are that the unit will not become obsolete; performance remains the same from the time of installation; and no additonal materials or parts are needed. The results of filed tests with the gas flame thermal incinerator are also discussed.

7739 APTIC NUMBER 19285

Walker, Brooks
EXHAUST RECIRCULATION CONTROL FOR AN ENGINE. (Assignee not given.) U. S. Pat. 3,507,260. 4p., April 21, 1970. 2 refs. (Appl. May 1, 1967, 3 claims).

A device is described which controls the recirculation of exhaust gases in a four stroke cycle internal combustion engine and reduces the nitrogen oxides in the exhaust. Nitrogen oxides are produced in the combustion chamber when the temperatures are high and the mixture is lean. They are usually lower and within the limits of control when the engine is idling and on low power at low speeds. They are also lower at high power when the power valve enriches the mixture over the level cruise mixture. The device has an exhaust pipe and an inlet pipe for conducting a combustible fluid to the engine. Another pipe connects the exhaust and inlet pipes, while a valve controls the flow of exhaust gases through the pipe. The valve controls the recirculation of part of the exhaust gases at closed throttle and decelerations, and also at operating conditions when the intake suction is less than a predetermined limit, such as 5 inches of mercury. For optimum fuel atomization and reduced nitrogen oxides content of the exhaust, an engine speed sensor reduces the exhaust recycle volume below a selected engine speed. It allows recycling of part of the exhaust to the intake between the speed and operating conditons with a suction higher than 5 inches of mercury.

7740 APTIC NUMBER 19200

Wallace, Thomas J. and Barry W. Heinlich
DESULFURIZATION OF PETROLEUM RESIDUA. (Esso Research and Engineering Co., Elizabeth, N. J.) U. S. Pat. 3,505,210. 7p., April 7, 1970. 6 refs. (Appl. June 4, 1968, 15 claims).

The conventional process for desulfurization of petroleum fractions is catalytic hydrodesulfurization. However, heavy stocks such as crude oil, gas oil, and residua cannot be hydrodesulfurized as readily as the lighter hydrocarbon fractions; the process consumes hydrogen in quantities in considerable excess of the stoichiometric requirement for sulfur removal, thus making it costly. A method to desulfurize heavy petroleum hydrocarbon fractions, and particularly petroleum residue, is described. The method involves (1) contacting the hydrocarbon fraction with an oxidizing agent in a aqueous acidic medium, thereby oxidizing bivalent sulfur compounds such as thiophene to sulfur-oxygen compounds such as sulfoxides and sulfones, (2) contacting the oxidized hydrocarbon fraction containing the sulfur-oxygen compounds with a molten alkali metal hydroxide, thereby rupturing the carbon-sulfur bond and forming water soluble sulfur compounds, and (3) recovering a hydrocarbon fraction of reduced sulfur content. (Author summary modified)

7741 APTIC NUMBER 19542

Wallden, Sven Johan and Ruth Saga Mariana Wallden
IMPROVED PROCESS FOR THE RECOVERY OF ELEMENTAL SULPHUR FROM GASES CONTAINING SULPHURETTED HYDROGEN. (Imperial Chemical Industries Ltd., London (England) and Bolidens Gruvaktiebolag, Stockholm (Sweden)) British Pat. 524,345. 3p., Aug. 5, 1940. (Appl. Jan. 27, 1939, 8 claims).

In the roasting, smelting, or other metallurgical treatment of ores containing sulfuriferous minerals, there are obtained gases containing larger quantities of sulfur dioxide. When reducing sulfur dioxide to elemental sulfur, small amounts of H2S, carbon disulfide, and carbon oxysulfide are formed. These compounds lead to a low sulfur yield and involve a risk of damage to the surrounding area. Yet, they can be eliminated if the velocity of the gas in the reduction process is regulated so that a sufficient quantity of SO2 remains in the emerging gas for a secondary reaction with the H2S, CS2, and COS. The secondary reaction should be conducted at temperatures below 350 C. The catalysts used in this process consist of water soluble alkali compounds which are converted into alkali metal sulfides and thio-sulfates when treated with the H2S at a low temperature. At higher temperatures, the catalysts should be applied to a porous base with the largest possible surface, such as brick or pumice. They can also be applied to a porous mass with compounds containing water of crystallization of hydration water. Such substances exert an absorbent action on H2S and other gases. The catalysts gradually become coated with an inactive dust originating from impurities in the gas. The surface can be activated by rinsing with aqueous solutions of the salts.

7742 APTIC NUMBER 19829

Wallden, Sven Johan and Ruth Mariana Sundgren-Wallden
METHOD OF RECOVERING ELEMENTAL SULPHUR FROM GASES CONTAINING

SULPHURETED HYDROGEN, CARBON OXYSULPHIDE, AND CARBON DISULPHIDE. (Imperial Chemical Industries Ltd., London (England) and Boldens Gruvaktiebolag, Stockholm (Sweden)) U. S. Pat. 2,316,201. 3p., April 13, 1943. (Appl. Dec. 10, 1938, 6 claims).

Sulfur is produced from sulfur-compound bearing gas streams emitted in roasting, smelting, or other metallurgical treatment of sulfurous ores. The gases are mixed with sulfurous acid and conducted at a temperature below 350 C over a catalyst comprising a water-soluble compound of an alkali metal capable of forming an alkaline aqueous solution, e.g., Na2O, Na2S, and Na2CO3. Suitable catalysts may also be made by a combination of alkali compounds with other compounds. The process may also be used for neutralizing H2S-bearing exhaust gases from other industrial operations.

7743 APTIC NUMBER 19931

Wallin, Oscar W., Jr.
FUEL VAPOR RECOVERY SYSTEM. (Atlantic Richfield Co., Phila., Pa.) U. S. Pat. 3,513,818. 5p., May 26, 1970. 4 refs. (Appl. March 11, 1968, 11 claims.)

A fuel evaporation emission control system is described for reducing atmospheric fuel vapor emissions from internal combustion engine powered vehicles. The system consists of a vapor condenser, positioned below the carburetor and above the fuel tank, provided with vent lines between the flat bowl, the crankcase, and the gas tank. The vent line between the condenser and the crankcase is a direct line, and its position and relative size as compared with the other vent lines are such that the majority of fuel vapors from the condenser will flow into the crankcase. Previous systems include a vent line for the condenser which flows into the crankcase through an elevated loop. This loop often causes vapors to flow into the carburetor bowl, rather than into the crankcase. Since it is desirable to have the fumes vent into the crankcase, this loop is a liability to the system. The system described eliminates this loop, thus providing the most desirable routing of the vapors.

7744 APTIC NUMBER 19151

Ward, Alger L., Claude W. Jordan, and Charles G. Milbourne
PRODUCTION OF ELEMENTAL SULPHUR FROM HYDROGEN SULPHIDE AND SULPHUR DIOXIDE. (United Gas Improvement Co., Philadelphia, Pa.) U. S. Pat. 2,043,084. 9p., June 2, 1936. (Appl. Jan. 23, 1933, 9 claims).

A method to produce elemental sulfur by reacting hydrogen sulfide and sulfur dioxide is described. The process is an improved method of effecting the reaction between H2S and SO2 to form elemental sulfur by allowing the reaction to go to approximate completion during a relatively short period of contact. The process involves introducing H2S gas into an aqueous solution of SO2 in a reaction vessel and simultaneously beating the H2S into solution by violent agitation. The main advantage of this method is the short exposure time, which eliminates the necessity of large and expensive apparatus per unit of capacity.

7745 APTIC NUMBER 19286

Ward, William J., III.
LIQUID MEMBRANE FOR SULPHUR DIOXIDE EXTRACTION. (General Electric Co., Schenectady, N. Y.) U. S. Pat. 3,503,186. 3p., March 31, 1970. 3 refs. (Appl. Aug. 15, 1968, 4 claims).

The invention provides a permeable cellulose membrane impregnated with a film of liquid polyethylene glycol, e.g., tetraethylene glycol dimethyl ether, for the separation of sulfur dioxide from a gas mixture. The membrane is obtained by dissolving a matrix-forming cellulose derivative and a pore-producing agent in an organic solvent to form a casting solution. The solution is cast to form a very thin membrane from which a portion of the organic solvent is evaporated in an ambient fluid having a partial pressure approaching, but less than, that of the organic solvent. The film so developed is then hydrolyzed to cellulose in a caustic solution, after which the hydrolyzing agent is leached out and the cellulose film impregnated with the liquid polyethylene glycol. Application of the invention to smelter stack gas is discussed.

7746 APTIC NUMBER 19488

'AIR POLLUTION CONTROL' MEETING AND EXHIBITION. (Kongress und Ausstellung 'Reinhaltung der Luft'). Text in German. Wasser Luft Betrieb, 14(2):67-74, Feb. 1970.

Wet collectors, electrostatic precipitators, and odor counteraction equipment are reviewed, in the light of an exhibition presented at the 1969 Air Pollution Control Meeting in Dusseldorf. Scrubbers with pressure losses of 100, 250, and more than 1000 mm water were exhibited. The low pressure scrubbers on display mostly used atomized water for cleaning. A satisfactory collection efficiency can be obtained if the dust particles are larger than 5 microns. As the exhibition showed, great efforts were made to reduce the cost of electrostatic precipitators. A unit with a conical tube as the collection electrode and a flowing water curtain attracted the greatest interest. The apparatus which was presented for separation of odorous gases mainly operated with adsorption or absorption. The so-called K-absorber, where the absorbent is spread out on several levels, received the greatest attention. Depending on the number of levels, the pressure losses are between 200 and 50 mm water, while the gas speed is between 2 and 7 m/sec. Brief reviews of the papers presented at the meeting are given. They include a discussion of European cooperation in the field of air pollution; fossil fuels, their origin, spread, mining and economic importance; air pollution caused by traffic; reduction of undesired emissions by conventional engines; mathematical models for determination of emissions; a new method for determination of the minimum stack height; new developments in the field of dust monitoring units, statistical factors is the measurement of air pollutants; biologic air pollution measuring methods; reduction of emissions

is the steel, viscose, and food industries; soot separation at oil-fired furnaces; results of thermal, catalytic and chemical processes for odor counteraction; emission reduction through low-smoking fuels prepared by various methods; and finally discussion of desulfurization of hard coal.

7747 APTIC NUMBER 19448

Weber, Neill and J. T. Kummer
SODIUM-SULFUR SECONDARY BATTERY. Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 37-39. 4 refs. (May 16-18.)

A secondary battery is described which uses liquid sodium as an anode and liquid sulfur as the oxidant in the cathode compartment. The cathode can be porous carbon. The electrolyte is a solid ceramic membrane which is impervious and resistant to chemical attack by sodium, sodium polysulfides, and sulfur. It operates in the temperature range of 250- 300 C. The operation of this battery is based on the electrochemical properties of a crystalline solid similar to beta-alumina. Because of the absence of irreversible electrode processes and because the current efficiency is 100%, the cell is capable of high charging efficiencies. Operational data have been obtained using experimental, laboratory-type cells but no large cells have been constructed. The chief disadvantage of this battery is the high temperature of operation. At room temperature where the sodium and sulfur are solid, the battery does not deliver significant amounts of current. The solution to this problem for motive power applications is to keep the battery hot at all times by insulation. It is estimated that a 60 kwh battery with 4 in dead air insulation would be able to keep itself at full temperature for one week at full charge. Provisions for cooling will be necessary during operation.

7748 APTIC NUMBER 19152

Weber, Richard J.
CYCLE EFFICIENCY OF AIR-COOLED STEAM POWERPLANTS. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TM X-1970, 18p., March 1970.

Steam powerplants for mobile applications such as automobiles must use air-cooled condensers to reject waste heat. A preliminary study is made of the effect of major design parameters on the efficiency of various steam cycles of this type. The efficiency of a typical system of the type usually considered for steam cars (0.155) can be improved by a factor of 1.3 through use of a more complex system that employs an air turbine.

7749 APTIC NUMBER 21914

Weeks, Thomas J. and Allan F. Furas
PERFORMANCE OF DUST RESPIRATORS AGAINST A FIBROUS DUST. Am. Ind. Hyg. Assoc. J., 31(3):290-293, May-June 1970. 7 refs.

A reproducible, easily dispersed, respirable-size fibrous dust was prepared by micropulverizing and air-jet milling a Canadian chrysolite asbestos from the Johns-Manville Jeffrey mine. Three Bureau of Mines approved and five unapproved respirators were evaluated against this dust, using standard Bureau of Mines techniques. With one exception, all had fiber breakthrough below 1%. (Author abstract)

7750 APTIC NUMBER 19222

Weil, Edward D.
AIR FILTER. (Stauffer Chemical Co., New York) U. S. Pat. 3,513,644. 3p., May 26, 1970. 6 refs. (Appl. Sept. 19, 1968, 8 claims).

An air filter having a porous fibrous filtering base treated with a stable, non-volatile liquid dust adherent is described. The filter medium can be the conventional glass fiber mat type, or metal, paper, or cellulosic material. An improved dust adherent which is inexpensive, odorless, non-corrosive, and has a large dust catching capacity is used. The adherent is a liquid poly (haloethyl-ethyleneoxy) phosphoric acid ester having an average degree of condensation between 2 and 10. Previous dust adherents tended to run or bleed-off the filter medium, form sludge masses, or react unfavorably at high temperatures. The adherent described does not exhibit any of these undesirable qualities.

7751 APTIC NUMBER 19172

Werner, K.
DESULFURIZATION AND REFINING OF GASOLINE AND JET FUEL BY MEANS OF SURFACE-ACTIVE AGENTS IN A FLUIDIZED BED. Acta Chim. Acad. Sci. Hung., 36(1):289-298, 1963 (7). Translated from Hungarian. Foreign Technology Div., Wright Patterson AFB, Ohio, Translation Div., Sept. 30, 1966. (Presented at the Petroleum Conf., Budapest, April 1962.)
CFSTI: AD 803832

The feasibility of using adsorptive refining to simultaneously remove sulfur, oxygen, and nitrogen from low-boiling hydrocarbons was studied in a fluidized reactor. Experiments were carried out without the use of additional hydrogen at temperatures above the boiling temperature of the feed fractions. Various types of silica gel, active and crude alumina, and bauxite were used as components; these were in part activated by iron or other metals. Although silica gel possesses the greatest surface, the degree of desulfurization was perceptively below that of adsorbent mixtures containing iron oxide. Favorable desulfurization effects were also obtained with solidified and crude bauxite. Overall desulfurization amounted to approximately 80% at atmospheric pressure, while the basic and phenol components were substantially easier to remove than the sulfur compounds. Development of a continuous pilot plant is reported for about 20 kg/feed/hr, which is operated according to the principles of fluidization in both its refining and regeneration sections. Experimental results are tabulated.

7752 APTIC NUMBER 19449

Wilcox, Howard A.
LITHIUM-CHLORINE MOLTEN ELECTROLYTE BATTERY. (Army Electronics Command, Fort Monmouth, N. J., Proc. Conf. Power Sources, 21st Annu., 1967, p. 39-42. 7 refs. (May 16-18.)

A lithium chloride cell containing pure molten lithium chloride as the electrolyte is described. Although still in an early research stage, this type of cell is one of the few that promises sufficiently high performance in both the power and energy storage aspects to make it a reasonable candidate on technical grounds for vehicular propulsion applications. The operating temperature of this cell is about 1200 F. A variant of it might use a material like potassium chloride added to the electrolyte in order to lower the operating temperature by as much as 200-300 F. Current densities of at least 4000 amperes/sq ft at the cathode and at least 40,000 amperes/sq ft at the anode, all without suffering significant polarization losses, have been achieved. Experimental cells have been successfully operated for hundreds of hours and hundreds of charge-discharge cycles with coulombic efficiencies of 95% or better. A functionally complete closed-loop chlorine storage, feed, and control system has been successfully operated for over 3000 hours. However, such a system poses several potential problem areas. One of these is the toxicity of chlorine. This difficulty is only part technological; its solution will no doubt involve a host of legal, regulatory, and emotional factors as well. Other problems include start-up and shut-down of the high temperature lithium-chlorine battery, fast recharge, and self-discharge. In one respect the latter is fortunate, for it serves as a convenient source of 'trickle heat' to keep the battery at full operating temperature and ready for instant functioning. However, it also dissipates energy and thus somewhat increases the average cost of transportation to the owner.

7753 APTIC NUMBER 19463

Wilde, Cecil R.
PROCESS FOR REDUCING CRYSTALLINE SULFUR. (Stauffer Chemical Co.) U. S. Pat. 2,562,158. 3p., July 24, 1951. (Appl. June 2, 1950, 5 claims).

Sulfur is produced from the reaction between hydrogen sulfide and sulfur dioxide in a crystalline or micro-crystalline form which settles rapidly and is easy to wash, filter, and dry, rather than as a colloidal suspension or amorphous precipitate as from conventional processes. A mix of about 6-30 mols of H2S with a mol of SO2 is introduced into an aqueous medium at a temperature of at least 180 F to form and recover crystalline sulfur. The critical factor is that the H2S be in excess of the stoichiometric proportions; the excess should be from about three to 15 times the combining or equivalent quantities. On a molal basis, these limits should be doubled. Below an excess of about three times, only amorphous sulfur is produced. As the excess increases, the crystal size decreases. At an optimum of about 7.5 to 1, the crystals produced were within a range of from one-half micron to six micron in major dimension.

7754 APTIC NUMBER 19037

Wolfson, D. E., J. A. Beckman, J. G. Walters, and D. J. Bennett
DESTRUCTIVE DISTILLATION OF SCRAP TIRES. Bureau of Mines, Washington, D. C., Dept. of Investigations 7302, 19p., Sept. 1969. 6 refs.
CFSTI: PB 187734

Destructive distillation was a technically feasible method of disposing of and obtaining potentially valuable products from scrap automobile and truck tires. The relative amounts of the various products were highly dependent on the temperature of carbonization; the highest yields of liquid products were obtained at 500 C and of solid and gaseous products, at 900 C. Compositions of the liquid and gaseous products were also dependent on the test temperature: liquid components contained a higher percentage of aromatic components at 900 C than at 500 C, whereas gases from the high-temperature tests contained a higher percentage of hydrogen. Analyses and characterizations of the heavy oils by a standard procedure for coal tars, by gas chromatography, and by mass spectrometry indicate a mixture of a large number of components. In the volatile portion of the oils, 102 peaks were observed by gas chromatography. The light oils from 500 C tests contained more highly saturated hydrocarbons than from high-temperature tests in which substantial amounts of benzene and toluene were contained. Rubber vulcanizates containing tire cord fabric produced the same type of products as tests containing no fabric. Residues from all tests were friable carbonaceous materials, and the volatile-matter content was related to the carbonization temperature. Only a small amount of residue was obtained from the carbonization of a synthetic styrene-butadiene emulsion copolymer, and carbonization temperature had little effect on the sulfur content of the residue. (Author summary modified)

7755 APTIC NUMBER 19469

Woollam, J. P. V. and A. Jackson
THE REMOVAL OF OXIDES OF SULPHUR FROM EXIT GASES. Trans. Inst. Chem. Engrs. (London), vol. 23:43-51, 1945. 33 refs. (Presented at the Institution of Chemical Engineers North Western Branch Meeting, Manchester, England, March 17, 1945.)

A process is described for removing sulfur dioxide and trioxide from the exit gases of contact acid plants, boiler installations, and smelting processes. It consists of scrubbing the gases with a solution of ammonium sulfite, bisulfite, and sulfate mixture, keeping the pH value at a predetermined figure by the addition of aqueous ammonia, and bleeding off the make of solution to an autoclave where it is heated with steam to form ammonium sulfate solution and sulfur. On the basis of encouraging preliminary tests, a large-scale process facility was built at a contact acid plant. Testing and results are given in detail, and permit definition of the limits for optimum conditions. The SO2 and SO3 present in the exit gases can be reduced to less than 5% of their original value, and the price of the ammonia feed can be reduced to 60% of that for the pure 25% ammonia by the use of 18-20%

concentrated gas works liquor. Two applications of the process are briefly discussed: acid plant exit gas treatment, and 'devil gas' treatment with reference to a 15% hydrogen sulfide gas mixture.

7756 APTIC NUMBER 19456

Woolley, Samuel H.
AIR POLLUTION AND THE PROBLEM OF SULPHUR IN FUELS. Bank of New York Letter, 1967: 8p., Aug. 1967.

The emphasis on sulfur as the principal source of air pollution is criticized. Quoting responsible testimony to the effect that no evidence exists to substantiate that concentrations as high as 5 ppm are harmful to healthy humans even on a 40 hr/week basis, it is suggested that the H.E.W. imposed maximums of 0.5 ppm may retard the war on air pollution by draining off unnecessary technological dollars to attain an unrealistic sulfur goal at the expense of other significant pollutants such as particulates, hydrocarbons, and nitrogen oxides. Desulfurization of coal and oil are examined, as are conversion to natural gas and atomic power as means to obtain the levels directed by H.E.W. All show promise, but none can meet the H.E.W. established timetables. Two questions are posed which appear to require answers. Are regulations as severe as those proposed by H.E.W. necessary to reduce the health problem of air pollution inn the New York-New Jersey area? Will an intermediate objective produce faster and more effective results?

7757 APTIC NUMBER 19718

Wranau, Guido von and Charles John Phillips
GLASS SUITABLE PRIMARILY FOR GLASS FIBERS AND USE OF IT FOR THE MANUFACTURE OF GLASS FIBERS. (Insbesondere fuer Glasfasern geeignetes Glas und Verwendung desselben zur Herstellung von Glasfasern). Text in German. (Assignee not given.) Swiss Pat. 476 647. 5p., Aug. 15, 1969. (Appl. April 9, 1963, 20 claims).

A type of glass was devised which can be molten and formed into fibers at temperatures at which the refractory lining of the furnace is not damaged. It contains 40 to 59% by weight silicon dioxide, 7 to 17% aluminum oxide, 9 to 24% calcium oxide and 1 to 4% lithium oxide. The latter must constitute 2 to 7% by weight with one of the other oxides (sodium monoxide and potassium monoxide). This glass is molten and the fibers drawn from the melt at temperatures between 1100 and 1350 C. The glass fiber obtained is of high chemical resistance. The fibers are produced at a temperature that is 195 C below that at which all other known types of glass fibers are obtained.

7758 APTIC NUMBER 19256

Yamagami, Yoshihiko
AN APPARATUS FOR REMOVING SULFUR DIOXIDE FROM FLUE GAS BY OXIDIZING WITH OZONE. (Ozonsanka niyoru nenshohaigasu chuno aryusanqasu jokyo sochi). Text in Japanese. (Assignee not given.) Japanese Pat. Sho 45-3521. 1p., Feb. 3, 1970. (Appl. May 16, 1966, claims not given).

After passing through a heat exchanger, flue gas is oxidized with ozone to convert sulfur dioxide to sulfur trioxide. Since a cyclone system is employed for mixing ozone with the gas, the duration of the contact of both gases is increased; at the same time, dust and soot are removed from the bottom. Subsequently, the flue gas is rinsed with water in a chamber with a porous plate. Here SO3 in the gas reacts with water to form sulfuric acid, completing the elimination of sulfur from the gas. The H2SO4 formed can be effectively utilized as a by-product if neutralized by calcium carbonate, etc. The flue gas, after removal of its sulfur content, is led to the heat exchanger by a fan. The heated gas is then discharged into air with no harmful component. Air pollution due to flue gas can be completely prevented by the present invention.

7759 APTIC NUMBER 19232

Yamamoto, Norkio, Akira Watanabe, Tomitada Nakamura, and Saburo Yanagisawa
ELECTROSTATIC COLLECTION OF SULFUR OXIDES. (Iosankabutsu no seidenteki hoshuho). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 19(6):834-836, June 1970. 1 ref.

The electrostatic collection of sulfur oxides is examined. Sulfur dioxide is absorbed into an electrostatically charged mist generated by dc high voltage in one method. To obtain the mist, a solution of 3% hydrogen peroxide containing a small amount of iso-propanol was atomized from a stainless steel capillary as an anode. The higher the applied voltage on the electrodes, the better was the generation of the mist. With the mist generated from 10 to 20 ml of the solution, collection efficiency was 94% for 20 l of gas containing 1800 ppm SO2. The other method relates to the collection of sulfur trioxide aerosol by an electrostatic precipitator. Sulfur trioxide was passed through an absorber containing 3% hydrogen peroxide solution and the aerosol produced in the absorber was then led to the precipitator. Collection efficiency by this method was 100%. (Author abstract modified)

7760 APTIC NUMBER 19300

Yamauchi, Hitoshi
DUST COLLECTION EFFICIENCY OF THE TWO-STAGE VENTURI SCRUBBER. (2 dan bentsuri sukuraba no jojin koritsu nitsuite). Text in Japanese. Funtai Kogaku Kenkyu daishi (J. Res. Assoc. Powder Technol., Japan), 7(6):27-31, June 1, 1970.

To clean the blast furnace exhaust gas by two venturi scrubbers installed in series, a pilot plant was constructed at a steel works and a successful operation, as good as an electrostatic precipitator, resulted in industrialization. The blast furnace gas normally contained 3-5 g/cu Nm dust, which was reduced by a venturi scrubber to 100 mg/cu Nm. The desired cleanliness of 5-10 mg/cu Nm was obtained by the use of an electrostatic

precipitator. A theoretical consideration was made concerning the replacement of the precipitator with another venturi scrubber; the point at issue was whether the venturi scrubber was effective for a low dust-content gas of 100 mg/cu Nm. Based on a positive result of calculation, a pilot plant with a two-stage venturi scrubber was constructed. When only one venturi scrubber was used, the dust content was reduced from 3 g/cu Nm to 30 mg/cu Nm with efficiency at a pressure loss of 2500 mm H2O. When the two venturi scrubbers were used, the final dust content became 2 mg/cu Nm with the pressure loss of 1300 mm H2O and 1200 mm H2O, respectively, and at an efficiency of 97-98%. Based on the experimental results of the pilot plant, an actual plant of industrial size was constructed and began operation in 1965. Dust content was planned to be reduced from 5 g/N cu Nm at the entrance to 10 mg/N cu Nm at the exit. The present system is more economical than the electrostatic precipitator.

7761 APTIC NUMBER 19930

Yemchuk, E. M.
OXIDATION OF BLACK LIQUOR AT THE GREAT LAKES PAPER COMPANY LTD.
Pulp Paper Mag. Can. (Quebec), 71(14):45-50, July 17, 1970. 4 refs. (Presented at the Canadian Pulp and Paper Association, Technical Section, Midwest Branch, Thunder Bay, Ontario, 1969, Paper T299.)

Associated with any kraft mill industry is the odor of sulfide gas emitted from the recovery stack. Economically, the emissions represent a direct loss of the valuable sulfur element used in the kraft pulp cooking process. Sulfide losses can be reduced by oxidation of black liquor. The history of a black liquor oxidation system now in operation is reviewed. The system oxidizes black liquor by forcing air through towers flooded with liquor. Foam is produced and then broken back down into liquor. Various design difficulties encountered in eliminating the foam are described. With the present two stage system, oxidation efficiencies in excess of 90% are reached, reducing the sodium sulfide concentrations from 12 g/l to approximately one g/l.

7762 APTIC NUMBER 19302

Yoshioka, Naoya, Jun Emi, and Yukuo Tamori
FILTERING SMOKE AND MIST BY A PACKED LAYER OF FIBERS. (Senijutenso niyoru enmushitsu no roka). Text in Japanese. Funtai Kogaku Kenkyu Daishi (J. Res. Assoc. Powder Technol., Japan), 7(5):38-46, May 1, 1970. 38 refs.

Research on the pressure loss and collection efficiency of a packed-fiber filter, for the initial stage of no dust load, is reviewed for design purposes. Theoretical studies on the pressure loss include Kozeny-Carman's formula, and Langmuir's, Davies', Lamb's, Emersleben's, Iberall's, and Chen's equations. Among the experimental studies, Kimura-Yinoya's work is explained as it is extensive and well formulated. Particles are collected with a cylinder by the following mechanisms: inertial impaction, Brownian diffusion, direct interception, gravitational settling, electrostatic or thermal precipitation. A theoretical basis for each mechanism is presented. All the formulae, however, refer to an isolated single fiber, and are applicable only when the distance between each fiber is sufficiently large. When this assumption does not apply, an interference effect should be considered. In the low Reynolds number inertia region, Davies' formula is applicable. When the collection is performed in the diffusion region, Friedlander's half-empirical formula should be used. Collection in the region where blocking is predominant should be avoided, while fibers with the smallest diameter should be chosen for higher efficiency. Pressure loss should be calculated by Kimura-Yinoya's experimental formula.

7763 APTIC NUMBER 19251

Young, Henry T.
FILTER. (Assignee not given.) U. S. Pat. 3,513,638. 6p., May 26, 1970. 13 refs. (Appl. March 8, 1968, 2 claims).

A filter collector with groups of porous filter tubes is described. The groups can be shut off in sequence and backwashed from a single source of relatively low pressure air. The groups are individually accessible for replacement without interfering with other groups or mechanisms. Prior devices required complicated mechanisms for cleaning, could not be shut down individually, and required relatively high air pressures for backwashing. These problems are overcome with the filter collector described.

7764 APTIC NUMBER 19714

Zahradnik, Raymond L., Josephat Anyiqbo, Richard A. Steinberg, and Herbert L. Toor
SIMULTANEOUS REMOVAL OF FLY ASH AND SO2 FROM GAS STREAMS BY A SHAFT-FILTER-SORBER. Environ. Sci. Technol., 4(8):663-667, Aug. 1970. 7 refs.

A shaft-filter-sorber consists of a bed of slowly falling sorbent pebbles through which the gas stream to be cleaned passes horizontally. As determined by a series of experiments with alkalized alumina as the sorbent, this method has a 99+% filtration efficiency for SO2 at gas mass velocities of 150 lb/hr sq feet and dust loadings in excess of 3 grains per scf. The high filtration efficiency indicates that sorbent pebble filters can be used to remove fly ash while simultaneously removing gaseous SO2. The SO2 removal is predictable on the basis of static bed experiments, and a design curve based on this prediction is presented as a means of projecting removal efficiencies at higher gas velocities. (Author abstract modified)

7765 APTIC NUMBER 19390

Zawadzki, E. A.
REMOVAL OF SULFUR DIOXIDE FROM FLUE GASES: THE BCR CATALYTIC GAS PHASE OXIDATION PROCESS. Trans. Soc. Mining Engrs. AIME, vol. 232:241-246, Sept. 1965. 10 refs.

A progress report is presented on the development of a catalytic oxidation process for removing sulfur dioxide from flue gases. A catalyst was sought which would provide the high activity and the physical design of the platinum catalyst, but would be more economical. After extensive testing, a vanadium catalyst was developed which met these criteria. Efforts were then directed to recovery of the sulfuric acid produced in the process by condensation. Experiments were conducted using a small tubular heat exchanger as the acid collector. It was found that H2SO4 readily condensed over a wide range of temperatures, while the data indicated that a minimum of 85% of the sulfuric acid could be collected in the tubular condenser. Based on the assumption that a high-temperature electrostatic precipitator was commercially available, clean flue gases were supplied by a natural gas-fired furnace. Data on the condensation of H2SO4 were obtained at two flow rates and over a wide temperature range. The amount of H2SO4 in the condenser was found to be dependent on surface temperature, gas velocity, and amount of condenser surface. An optimum temperature for collecting H2SO4 was indicated at a given flow rate. The technical problems encountered with the high-temperature dust collectors, acid recovery, and acid disposal are also discussed.

7766 APTIC NUMBER 11847

Zawadzki, Edward A.
STATUS OF THE DEVELOPMENT OF PROCESSES FOR CONTROLLING SO2 EMISSIONS FROM STATIONARY SOURCES. Preprint, National Limestone Inst., Inc., Washington, D. C., 15p., 1969. (Presented at the National Limestone Institute, Inc., 24th Annual Convention, Jan. 16, 1969.

The principle sources of sulfur dioxide emissions in the United States are utility plants and, to a lesser degree, industrial-size stationary combustion units and smelters. By 1980, the estimated amount of sulfur dioxide emitted to the atmosphere annually will increase to 50 million tons, double the current rate. Controlling the emissions is difficult, and only limited success has been achieved to date. The principle factors affecting the development of pollution control systems, especially for power plant utilities, are size of unit, age of unit, load factor, and geographic location. In spite of the difficulties associated with the processing of flue gases, a large number of processes have been developed. They fall into two main classes: sulfur recovery systems that produce a product, and nonrecovery systems that yield innocuous wastes. The process that appears most readily adapted to existing power stations of all sizes is the dry limestone injection process. The capital cost of the process for a 200-megawatt station ranges from 1.2 to 1.6 million dollars. Annual operating cost is about 0.4 to 0.5 million, with about 20-25% of the cost attributed to the cost of limestone. Most other SO2 control processes are not economically suited to 200-megawatt and smaller stations.

7767 APTIC NUMBER 19048

Zentgraf, K. H.
THE PRESENT STATE OF FLUE GAS DESULPHURIZATION. (Stand der Abgasentschwefelung). Text in German. Mitt. Ver. Grosskesselbesitzern, 49(1):9-15, Feb. 1969. 11 refs. (Presented to the VGB, Emissions Meet., Salzburg, Bielefeld, and Saarbruecken, 1968).

The activated coal process developed by the firm Hitachi, the Kiyoura-TIT process, using vanadium pentoxide for oxidizing sulfur dioxide to sulfur trioxide and the Mitsubishi process, which converts the sulfur oxides to manganese sulfate, have only been tested with flue gases of oil-fired boilers. Additional equipment is required to use these processes for desulfurization of the dust-laden flue gases of coal-fired steam plants. In the U. S. a pilot plant using the alkalized-alumina-process is presently in operation. It treats 1300 cu m flue gas/hr, with an easily attainable 90% desulfurization. The main problem here is the development of a non-abrasive catalyst. The combustion-Engineering process - injecting pulverized calcium products into the boiler - is presently being tested in two coal-fired pilot plants with 1600 and 5000 cu m flue gas circulation per hr. Pilot operations using additive suspensions for injection into the boiler which are under way in Germany include the Reinluft process (low-temperature soft coal coke is used as adsorbent), and the Still process. Almost all desulfurization processes are still in the experimental stage. Investment costs run between $11 and $21/kW. In order to keep the operating costs reasonable the sulfur content of the fuel and utilization must be high. The Combustion Engineering and Bischoff processes, which are largely the same, have investment costs running at about $4/kW, but their useful lifetime is short, however.

7768 APTIC NUMBER 19246

Ajemian, R. S. and N. E. Whitman
MONITORING CARBON MONOXIDE IN AMBIENT AIR. J. Air Pollution Control Assoc., 20(5):310-311, May 1970. 4 refs.

A sampler is described that collects 12 consecutive samples by means of a timer programmer and solenoid valves, providing an inexpensive method of monitoring carbon monoxide simultaneously at several sites over a 24-hr period. The sampling interval of the programmer can be varied over a period of 12-54 min to obtain 12 air samples over a 24 hr period. Detection was made by setting the timer for 12 min and cutting the air flow back to approximately 0.30 l/min, while samples were collected in plastic bags containing approximately 3.5 liters and analyzed by a flame ionization detector. Since it produces little response in the hydrogen flame, carbon monoxide was converted catalytically to methane by mixing the carrier stream with the hydrogen and passing it over a nickel catalyst on fire-brick packed into a stainless steel tube. By using a 25-ml loop, concentrations as low as 0.1 ppm of carbon monoxide were detected. Should a gas chromatograph not be available, the silver salt of p-sulfaminobenzoic acid can be used, but the analysis would require considerably more time.

7769 APTIC NUMBER 19366

American Foundrymen's Society, Des Plaines, Ill.
AIR CLEANING EQUIPMENT. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 7, p. 33-56.

The basic types of industrial gas cleaning equipment are mechanical or inertial collectors, electrostatic precipitators, wet scrubbers, and fabric filters or bag collectors. Detailed information is given on characteristics and structure, selection criteria, advantages and disadvantages, operation, and maintenance for each of these. Operation and maintenance of catalytic combustion systems for odor control are also discussed. The efficiency, pressure drop variations, and temperature limits of various types of dust collecting equipment are considered, as well as the types and selection criteria for the fan components of these systems. Tables of collector efficiency and usual collector selection for foundry operations are included. Approximate equipment costs are briefly discussed.

7770 APTIC NUMBER 19006

American Society of Mechanical Engineers, New York, United Engineering Center
DETERMINING DUST CONCENTRATIONS IN A GAS STREAM. Rept. PTC 27-1957, 25p., May 1957. 21 refs.

A code applicable to the testing of any gas stream confined in a duct and carrying particles 1.0 micron or larger is presented. Procedures are also provided for making a size analysis of the dust sample. For the purpose of this code, dust is defined as particles of gas-borne solid matter larger than one micron mean diameter. Large gas-borne particles which are a product of combustion of solid fuel are usually referred to as cinders, but they come under the general heading of dust. Smoke, as distinguished from dust, is the result of incomplete or arrested combustion of the volatile components of fuels, and consists of particle sizes smaller than 1.0 micron. Soot is composed of agglomerated smoke particles. In determining the dust concentration, all materials caught should be included. The code does not include consideration of over-all tolerances or margins. Test results are reported as corrected from test observations; only calibrations having been applied. The determination of atmospheric dust count is outside the scope of the code.

7771 APTIC NUMBER 19365

American Foundrymen's Society, Des Plaines, Ill.
SAMPLING AND ANALYSIS FOR POLLUTANTS. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 6, p. 29-32. 18 refs.

General aspects of stack or duct sampling and of ambient sampling in the plant area, including meteorological and topographic factors, are briefly discussed. Location of sampling areas and measurement conditions should be guided by such considerations as distance from any elbow, entrance, transition or air moving device, gas volume fluctuations, gas stream conditions, and test duration. Some general requirements for sampling and analysis of particulate matter and gases are outlined. Considerable care is necessary in collecting samples for particle size determination, which must be obtained independently of collection efficiency samples. Particles 44 microns and larger should first be separated by standard screens, and then quantitated by microscope counting, wet or air elutriation, and centrifuge separation. However, each case must be considered individually and other techniques may be required. A bibliography of papers giving sampling and analytical procedures is included.

7772 APTIC NUMBER 19929

Astheimer, Robert W.
METHOD OF REMOTELY MONITORING STACK EFFLUENT. (Barnes Engineering Co., Stamford, Conn.) U. S. Pat. 3,517,190. 4p., June 23, 1970. 4 refs. (Appl. Dec. 1, 1967, 2 claims).

A method of remotely monitoring stack effluent is described. The smoke plume is illuminated near the top of the stack with a chopped source emitting radiation over a broad spectral region. A remotely positioned receiver, in proximity to the source, views the illuminated region of the plume in two spectral regions, one in an absorption band, and the other on either side of the absorption band. The receiver developes signals from the scattered radiation in the two spectral regions, and the ratio of these signals is utilized to measure the quantity of the absorbing gas in the illuminated cross section of the plume. Previous stack sampling methods required the samples to be taken from within the stack, often a time-consuming and cumbersome procedure. The method described is simple, easy to operate, and overcomes the

difficulties of previous methods. (Author abstract modified)

7773 APTIC NUMBER 19532

Ayer, Howard E.
SAMPLING METHODS FOR OIL MIST IN INDUSTRY. Am. Ind. Hyg. Assoc. J., vol. 25:151-157, March-April 1964. 17 refs.

Satisfactory reproducibility, sensitivity, and efficiency were found in samples for oil mist concentration taken by either the electrostatic precipitator or by glass fiber filters. Membrane filters and standard laboratory filter papers were unsuitable. Determination of size frequency distributions by stage weights from a commercial cascade impactor gave most promise as a routine field sampling method; membrane filter sheet was used on the impactor slides as a collecting reservoir. Microscopic methods for size frequency distribution were more tedious and the collection of suitable samples was more difficult. Light scattering photometers give the most convenient and accurate size frequency distribution where concentration is not too high. Composition of an oil mist depends on the parent material and the opportunity for oxidation in the generation and diffusion of the mist. (Author abstract modified)

7774 APTIC NUMBER 19609

Rab'in, V. I.
EFFECT OF SUSPENDED PARTICLES ON BREATHING RESISTANCE. Gigiena i Sanit., no. 10:49-51, Oct. 1969. 7 refs. Translated from Russian. Joint Publications Research Service, Washington, D. C., 7p., Jan. 2, 1970.
CFSTI: JPRS 49547

A classification system for coefficients of retention of aerosol particles in the respiratory organs was developed. Parameters of operation for the classification system included particle count, amount of material or weight, activity, charge, and accumulation period. Differences between experimental and theoretical values were within the limits of experimental and computational error, confirming the possibility of making calculations on the basis of the derived formulas. Refinement of the system of classification is recommended to include the location of the accumulation within the overall respiratory system as a product of the calculations.

7775 APTIC NUMBER 19631

Babajanian, E. P., V. M. Borodina, and I. B. Kaminir
AUTOMATIC COUNT OF MICROORGANISMS DIFFERING IN THE COLOR OF THEIR LUMINESCENCE. Prikl. Biokhim. Mikrobiol., no. 2:703-706, 1968 (?). 8 refs. Translated from Russian. Army Foreign Science and Technology Center, Washington, D. C., 8p., 1968.
CFSTI, DDC: AD 694169

Under certain conditions when cells are subjected to fluorochrome, live and dead cells can be distinguished on the basis of the differences in the color of luminescence. An analyzer of luminescent microorganisms was developed which carries out an automatic differential count of microorganisms, depending on the spectrum of their luminescence. This device is described in detail. It counts luminescent microorganisms with a minimal surface of 15-20 square micron. An automatic count of known live and dead yeast cells was conducted. A good correlation between the visual and automatic count was obtained. Automatic analysis of yeast cultures of different ages shows a decrease in the number of viable cells which occurs with aging, and a corresponding increase in the percentage of dead cells. By automatic analysis, sufficiently reliable information concerning the correlation between live and dead cells was obtained.

7776 APTIC NUMBER 11623

Barrett, William J.
IDENTIFICATION OF ORGANIC COMPOUNDS IN THE ATMOSPHERE. (SUMMARY REPORT). Southern Research Inst., Birmingham, Ala., Grant AP 00458, Proj. 1791, Sept. 1, 16p., Dec. 27, 1968. 8 refs.

A technique is described for concentration traces of oxygenated organic compounds in air. The method depends upon the use of a 0.125 by 4 inch copper tube filled with an ordinary gas chromatographic column packing. When a sample of approximately 1000 ml of polluted air is pumped through the tube with a rubber aspirator bulb, a sufficient quantity of pollutants is absorbed for subsequent detection and identification by gas chromatography with a hydrogen flame detector. The limit of sensitivity is estimated to be about 1 mg/l. Application of the method to samples collected at 17 St Stephen location resulted in the tentative identification of about 40 oxygenated organic compounds. (Author abstract modified)

7777 APTIC NUMBER 19716

Batz, Harry G. and Wolfgang Jacobi
CYLINDRICAL PLASTIC SCINTILLATORS FOR MONITORING BETA-GAMMA-ACTIVITY IN AIR AND WATER. Health Phys., vol. 19: 659-664, June 1970.

A beta-sensitive plastic scintillator is described that permits the monitoring of fission products and Ar(41) in effluent ducts from a nuclear reactor. The scintillator, whose base material is polyvinyltoluene, has a wall thickness of 5.8 mm and is coated with titanium dioxide that is surrounded by Al-foil. The resulting total thickness of the reflection coating and the Al-foil is about 10 mg/sq cm, and incident electrons with an energy lower than 0.1 MeV are totally absorbed in the scintillator cover. The scintillator tube is drawn up on a plexiglass cylinder that conducts light to the cathode of a multiplier. Sensitivity of the detector to gamma rays in air and to radionuclides in water is assessed. Detection limits for Sr(90) plus Y(90) are below the MPV-value recommended by ICRP. Unlike thin-walled or large, proportional counters, the detector can withstand high-pressure loads.

7778 APTIC NUMBER 19902

Benarie, M. and S. Panof
NOTES ON THE PREDICTION OF SOLID PARTICLES IN SUSPENSION IN A TURBULENT GAS FLOW. (Notes sur le prelevement des particules solides en suspension dans un gaz en ecoulement turbulent). Text in French. Aerosol Sci., 1(1):21-33, 1970. 11 refs.

Experiments were conducted on sampling polydisperse dust particles up to four millimicrons in diameter. The particles were blown down a vertical wind tunnel and sampled at three different kinds of head at velocities that were equal to 0.5, 1.0, and 2.0 times the wind velocity. The relationship between the ratio of the apparent to true concentration and the ratio of sampling to wind velocities was found to agree with a previously reported expression. Isokinetic sampling is essential to obtain correct concentration values; the error is smaller when the sampling velocity is too high than when it is too low. The shape of the head was not important and changes in particle size distribution due to anisokinetic sampling were not detected.

7779 APTIC NUMBER 21662

Bersis, D. S.
NEW METHOD FOR THE STUDY OF CHEMILUMINESCENCE AT SIMULTANEOUS FLUORESCENCE. (Ein neue Methode zum Studium der Chemilumineszenz bei gleichzeitiger Fluoreszenz). Z. Physik. Chem. Neue Folge (Frankfurt), vol. 22:328-335, 1959. 6 refs. Translated from German. Belov and Associates, Denver, Colo., 10p., April 14, 1970.

The apparatus and experimental procedure are described for the simultaneous but separate determination of the chemiluminescence and fluorescence of reactions. With this method, the samples under study are radiated with ultraviolet light impulses from which only monochromatic radiation of wave length 3650 A is filtered. The emissions produced by chemiluminescence, in the form of continual components, and by fluorescence, in the form of superimposed alternating current components, are registered separately and measured by a photostream amplifier which does not receive any ultraviolet light at all, since the excitation line of 3650 A is totally absorbed by additional filtering. The method was applied to experiments on the chemiluminescence of thiocyanate B produced by ozone. In contrast to results in the literature obtained with conventional neutralizing agents, the effect of ozone on thiocyante B in an amylacetate solution produces a blue-green chemiluminescence by a blue-green fluorescence.

7780 APTIC NUMBER 19173

Bessen, Alan
PATTERN-RECOGNITION LOGIC ANALYZES INFRARED SIGNALS. Electronics, 41(23):112-118, Nov. 11, 1968.

A prototype analyzer is described in which parallel active filters and standard logic elements are added to a rapid-scan Michelson interferometer, permitting both simultaneous detection of several pollutants and accurate identification. The signal from the interferometer is processed in an electronic data-analyzer unit using Fourier-transform and decision-theory methods; a light turns on when a given contaminant exceeds a threshold level, and the analyzer can be tuned to distinguish another set of pollutants by simply changing the logic cards. One unit can handle several remote sensors, giving a readout from each location every second. The system is relatively insensitive to variations in intensity of the infrared source and changes in electronic-amplifier gain, and is not seriously affected by interfering background materials. The comb filter used to analyze the interferometer's output is a parallel set of highly selective electronic bandpass filters with fixed center frequencies; all the comb filter outputs are available simultaneously, making for rapid instrument response. An example is given of the discrimination test required to identify a contaminant and to distinguish it from similar interfering substances. A filter-output equation for the combined effect of the interferometer and filter, representing a mathematical model of the system, is developed. A computer simulation was carried out to determine the identification logic, in which a given computer run yielded the response of each filter channel to the absorption spectrum of a specified substance, from which the system response to each substance was determined.

7781 APTIC NUMBER 21921

Bogen, Donald C.
PREPARATION OF RADIOACTIVE-LABELED POLYSTYRENE LATEX MONODISPERSED SUBMICRON AEROSOLS. Am. Ind. Hyg. Assoc. J., 31(3):349-352, May-June 1970. 6 refs.

Submicron monodispersed polystyrene latex aerosols have been labeled radioactively with I(131) by emulsion polymerization. By the use of catalytic reagents and heat, the polymerization process is started, and subsequently the contaminants are removed by dialysis. Gamma counting of an aliquot of the labeled suspension indicated that about 40% of the initial activity remained on the particles. No significant removal of the label was found with heat or reduced pressure. During application of the labeled aerosol to filter penetration and collection studies, gamma-counting values were obtained which compared closely with microscopy values. Also, the labeling of the particles did not significantly increase the particle size. (Author abstract)

7782 APTIC NUMBER 19076

Bohlander, R. F.
AUTOMATIC STEAM DISTILLATIONS OF FLUORIDE INTO SMALL VOLUMES. Preprint, National Lead Co. of Ohio, Cincinnati, 15p., Feb. 7, 1969. 4 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Cleveland, Ohio, March 2-7, 1969, Paper NLCO1039.)

A rapid method is described for separating fluorides from interfering ions without excessive dilution, in which a controlled-temperature Willard-Winter type still is combined with a new distillate recycler. Fluorides are trapped out of the distillate with thorium, after which the distillate is boiled

and the steam reintroduced into the still. In this manner, the fluorides are removed from the samples in 20 minutes and isolated in a form that requires no further preparation prior to the color development. The apparatus developed for this distillation is relatively simple and inexpensive, and the fluorides are separated into less than 20 ml of distillate. Fluoride concentrations of less than 1 microgram/ml can be determined accurately. The recycling still is especially well suited for the determination of micro quantities of fluoride in samples containing large amounts of interfering materials. The small volume of distillate produced makes the apparatus several times more sensitive than ordinary Willard-Winter type stills. It has no boiler to fill and no receiver cup to overflow if forgotten. Because of automatic temperature control, automatic timing, and automatic shutdown features, very little of any analyst's time is required for operation. (Author abstract modified)

7783 APTIC NUMBER 21905

Bortoli, M. de and E. Van Der Stricht
SOME CHEMICAL PROCEDURES FOR THE RADIOLOGICAL MONITORING OF THE ENVIRONMENT. European Atomic Energy Community, Ispra(Italy), Joint Nuclear Research Center and Commission of European Communities, Luxembourg (Belgium), Directorate General Health and Safety, 57p., 1969. 11 refs.
CFSTI: EUR-4388-E

Chemical methods for the survey of environmental radioactivity on the site of the Euratom Ispra Establishment are described. On the theory that an analysis is no better than the sampling procedure, sampling methods for water, atmospheric dust, fall-out, total human diet, herbiage, and soil are included. Procedures are given for sample preparation; separation of strontium, cesium, and plutonium; and the determination of stable strontium, calcium, potassium, and uranium. (Author abstract modified)

7784 APTIC NUMBER 20790

Brar, S. S., D. M. Nelson, J. E. Kline, P. F. Gustafson, F. L. Kanabrocki, C. F. Moore, and D. M. Hattori
INSTRUMENTAL ANALYSIS FOR THE TRACE ELEMENTS PRESENT IN CHICAGO AREA SURFACE AIR. J. Geophys. Res., 75(15):2939-2945, May 20, 1970. 8 refs.

On April 8, 1968, surface air particulates were collected on cellulose fiber filters simultaneously at 22 different locations throughout the Chicago metropolitan area. A 1-sq cm portion of each filter was irradiated with thermal neutrons in a CP-5 research reactor. The neutron-induced nuclides were analyzed by gamma-ray spectrometry with 10.2 cm by 10.2 cm (4 in. by 4 in.) and 7.6 cm by 7.6 cm (3 in. by 3 in.) cylindrical NaI(Tl) crystals and a 400-channel analyzer. By varying the neutron flux and the time of irradiation, twenty trace elements in the surface air were detectable by purely instrumental means. The following elements, listed in decreasing order of concentration, were present: iron, chlorine, aluminum, zinc, manganese, sodium, bromine, vanadium, chromium, antimony, mercury, selenium, cerium, silver, cobalt, lanthanum, scandium, cesium, and europium. The average concentrations varied from 2400 to 0.12 ng/cu m air. Calcium concentrations in air were not quantitated. (Author abstract modified)

7785 APTIC NUMBER 21715

Burdick, Charles L.
ANALYTICAL DETERMINATION OF OXIDES OF NITROGEN IN GAS MIXTURES. Ind. Eng. Chem., 14(4):308-310, April 1922. 1 ref.

The nitrogen oxide content and degree of oxidation of a mixture of nitrogen oxides diluted with nitrogen or air are conveniently determined by washing a measured volume of the gas in dilute alkali. A procedure and apparatus employing this principle are described in detail. They are based on the radical change in gas composition induced by the fall in the temperature of the gas during its passage to the absorption bottle and the condensation of fog or mist particles: the mixture changes from one containing substantially nothing but NO2, NO, water vapor, and diluent gas to a two-phase mixture containing aqueous nitric acid in the liquid phase as a mist, and NO2, NO, and water vapor in the gaseous phase, the whole being at almost chemical equilibrium. It is the composition of this latter mixture which determines the absorption behavior in the presence of the alkali. The apparatus thus consists of two parts, an alkali train for the absorption of all of the NO2 and part of the NO and an aspirating bottle in which the quantity of escaping NO is determined.

7786 APTIC NUMBER 21942

Burger, Edward J., Jr., Norman Peterson, Jere Mead, and Karol Wisnieski
METHOD FOR MEASURING LUNG GAS VOLUME. J. Appl. Physiol., 27(5):721-725, Nov. 1969. 4 refs.

A method for measuring lung gas volume was developed which is adaptable to any body plethysmograph and does not require a pressure transducer or any recording equipment, except a micromanometer. A pressure switch, activated at mouth pressures of +10 cm H2O causes simultaneous volume signals to be stored. A circuit provides a meter indication of the volume change between the set pressures. The meter reading, applied to a nomogram, yields the corresponding lung gas volume. Details of the construction of the device are presented, with one nomogram to aid in calculating lung volume, the other to assist in deciding how many measurements should be made on each subject, and the results of two separate series of measurements. (Author abstract modified)

7787 APTIC NUMBER 19113

Byers, H. Lee, John W. Davis, Eugene W. White, and Ralph E. McMillan
A COMPUTERIZED METHOD FOR SIZE CHARACTERIZATION OF ATMOSPHERIC

AEROSOLS BY THE SCANNING ELECTRON MICROSCOPE. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 16p., 1970. 11 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

A scanning electron microscope (SEM) interfaced with a digital computer is capable of producing reliable size measurements of atmospheric particulates by the rapid processing of images of a large number of particles. High resolution (150-500 A) and greater depth of field represent additional advantages of this method over light microscopy. Atmospheric sampling techniques for direct sample submission to the SEM are also described. Characteristics of the scanning electron microscope are discussed, as well as the use of binary coded maps for programming calculations of particle size and shape parameters. Preliminary results on size distribution of atmospheric samples are in the ranges reported by other investigators, indicating the feasibility of this method for studies of particle size and, eventually, of particle shape and chemical composition, thus providing a potential for linking atmospheric particles to a specific source. The method has sigificance as a reference for less sophisticated and accurate measurements, and is expected to increase an understanding of air ecology with numerous specific applications.

7788 APTIC NUMBER 19693

UNUSUAL SAMPLER HALTS CONTAMINATION. Can. Chem. Process., 54(7):51-52, July 1970.

A simple gas sampling device promises a new flexibility in field sampling of atmospheric contaminants. The device is made from two 2 1/4-in. stainless steel, dome-shaped discs closely fitted one on top of the other and then perimiter welded. Flexing of the two diaphragms causes the discs to snap open, creating the vacuum required to draw in a sample. Crimpling of the hyperdermic needle attached to the side of the container permanently seals the sample. Transfer problems are simplified since injection of the gas sample to a gas chromatographic or mass spectrometer is accomplished through a septum.

7789 APTIC NUMBER 21881

Chapron, Yves, Genevieve Paltot, Henri Francois, and Anne-Marie Grand-Clement
PROCEDURE FOR DETERMINING THE ATMOSPHERIC CONTENT OF GASEOUS POLLUTANTS, AND A MEASURING CELL FOR THE APPLICATION OF THIS METHOD. (Procede pour determiner la concentration d'une atmosphere en gaz polluants et cellule de mesure pour la mise en oeuvre du procede). Text in French. (Commissariat a l'Energie Atomique, Paris (France).) Swiss Pat. 450,763. 4p., Jan. 31, 1968. (Appl. June 9, 1965, 6 claims).

A procedure is described for continuous determination of the atmospheric content of halogens, halogen acids, hydrocyanic acid, and gaseous cyanide derivatives. Measurement is via an electric current proportional to the concentration, which is generated in an electrolyte previously exposed to the air to be measured and contained in an electric cell. The device has a wide range of measurement. It can detect quantities of fluorine dissolved in the electrolyte in the range 0.2-150 micrograms per milliliter. This corresponds to an atmospheric concentration of hydrogen fluoride between 0.05 micrograms per liter and 35 micrograms per liter. Further refinement could increase the sensitivity to 0.025 micrograms per liter of HF in the atmosphere. One electrode of the detecting cell is made of aluminum, silver, or platinum, while the second electrode is made of stainless steel and is internally coated with platinum or nickel. The cell is designed with a concave structure of the electrodes, permitting a large surface of exposure to the electrolyte.

7790 APTIC NUMBER 21871

Charpin, J., G. Segretain, J. Aubert, M. Charpin, M. Mallea, and M. Soler
A NEW EVALUATION OF MILDEW IN THE ATMOSPHERE OF PARIS; COMPARISON OF RESULTS OBTAINED ON PETRI DISHES AND SLIDES IN 1966 AND 1967. (Nouvel inventaire des moisissures de l'atmosphere de Paris; comparison des resultats sur boites de Petri et sur lames en 1966 et 1967). Rev. Franc. Allergol., 10(1):9-25, 1970. 8 refs.

Air pollution has allergenic aspect, inasmuch as certain allergens are created or at least spread by industrial emissions, especially those of certain oleaginous substances such as castor oil, the latter substance being the source of some great urban asthma 'epidemics' in Marseilles, France, and more recently at Dieppe. On the other hand, most allergens (pollens and fungal spores) are of natural origin. Petri dishes with a 10 cm outer diameter were exposed for 10 minutes per day, from January 1966 to December 1967, and the cultures were observed for 15 days following the sample-taking. Another study method consisted of exposing slides coated with glycerinated gelatin in a Durham apparatus, and changing them every 24 hours. It was found that these two methods are complementary. For example, the spores of Ustilago and Tilletia are best identified in the uncultured form, whereas Penicillium and Aspergillus are best identified from their cultures. Some spores, such as Cladosporium, Alternaria, and Stemphyllium, have a seasonal rhythm of appearance, whereas others, such as Penicillium and Aspergillus, can occur throughout the year. A list of 48 species that occurred during the course of the two years is given, together with the frequency of occurrence. A few of the more commonly occurring species are tabulated according to months of the year. Results are compared with those of earlier studies involving both techniques.

7791 APTIC NUMBER 19614

Chernyy, T. I.
DUAL-CONE HYDROCYCLONE. (Dvukhkonusnyy gidrotsiklon). Text in Russian. Tsvetn. Metal., 40(6):26-28, 1967.

A dual-cone hydrocyclone is described, intended for the classification of finely crushed ore. The upper classification cone has walls inclined at 15 deg; the vertex angle of the lower coagulating cone equals 65 deg. The upper cone tapers from a

750-mm diameter base to a diameter of 500 mm at the top; the total height of the upper cone is 1615 mm. This unit has been tested industrially for the classification of ferrous quartzite to a grain size of 0.0071 mm and was 65% efficient in classifying feed containing 50-55% of the desired grain size or smaller, at a feed rate of 850 cu m/hr. Of the particles smaller than 71 mu m in size, 81-83% were ejected.

7792 APTIC NUMBER 21948

Chow, Tsaihwa J.
LEAD ACCUMULATION IN ROADSIDE SOYL AND GRASS. Nature, 255(5229): 295-296, Jan. 17, 1970. 4 refs.

Studies on lead isotopes in samples of roadside soil and grass are reported. Lead was isolated by an ion exchange technique, and converted to a sulfide form; its concentrations were determined by isotope dilution. Due to the direction of the prevailing winds, the lead content in the surface soils along the east side of the roads was higher than that of the west side. The isotopic compositions of lead at the surface and at depth of soil are characteristically different. Lead in the soil 10-15 cm below the surface had an isotope composition averaging Pb(206)/Pb(204) equals 18.77, Pb(206)/ Pb(207) equals 1.197, and Pb(206)/Pb (208) equals 0.4827; that of the surface soil averaged Pb(206)/Pb(204) equals 18.41, Pb(206)/Pb(207) equals 1.178, and Pb(206)/Pb (208) equals 0.4817. Comparison of the surface soil lead with that of gasoline shows that these two kinds of lead are identical. This indicates that the excess lead in the surface soil can be attributed to automobile exhausts. The isotopic composition of lead in the grass is similar to that of the surface soil, indicating that the grass derived its lead from this source. Part of this lead may come from the direct fallout of lead aerosols onto the grass.

7793 APTIC NUMBER 19275

Ciuhandu, G. and V. Bockel
DETECTION AND MEASUREMENT OF ATMOSPHERIC CARBON MONOXIDE. (Detection et dosage de l'oxyde de carbone dans l'air). Text in French. Chim. Anal. (Paris), 52(5):525-530, May 1970. 22 refs.

Carbon monoxide detection technique utilizing spectroscopic detection of carboxyhemoglobin, adopted by the Toxicology Division of the International Union of Pure and Applied Chemistry, can detect quantities of CO down to 0.001%, with less than 10% error. Various authors have proposed the use of palladium compounds. A method is proposed which permits determination of CO in 10-60 minutes where the content is as low as 0.0025%, with an error of less than 2%. A content of 0.001% can also be determined in about 90 minutes. If air aspiration is used, only 30 seconds is required for the detection of 1% CO, and 5 minutes for 0.05% CO. The method consists of bringing the test gas through a bubble tube containing an alkaline solution of silver and sodium p-sulfoxylbenzoates until the reagents turns yellow. Given constant temperature and pressure, the extension of 420 mm is proportional to the CO concentration and to the bubbling time. After the reagent has changed color, it may be replaced, and the tube used over again. Instructions are given for calibrating the bubble tube.

7794 APTIC NUMBER 21737

Clayton, George D.
DETERMINATION OF ATMOSPHERIC CONTAMINANTS. Am. Gas Assoc. Proc., 1953: 892-923. 21 refs.

Information is compiled on certain selected sampling equipment and analytical procedures currently in use in air pollution investigations. For purposes of organization, sampling is divided into two broad sections of particulate matter and gases, and the various equipment are considered under their appropriate category. A table is included in the section on analytical procedures which correlates sampling techniques with the appropriate laboratory procedure for each pollutant considered. In order to relate the selection of sampling equipment to realistic values, a section includes results of air pollution surveys performed at four representative locations in the United States. The areas selected are Detroit-Windsor, Los Angeles County, Charleston, West Virginia, and Cincinnati, Ohio.

7795 APTIC NUMBER 21967

Cleary, Graham J.
DISCRETE SEPARATION OF POLYCYCLIC HYDROCARBONS IN AIR BORNE PARTICULATES USING VERY LONG ALUMINA COLUMNS. J. Chromatog., 9(2):204-215, Oct. 1962. 16 refs.

An unusually long alumina column is used to obtain good separation of the complex polycyclic fraction of air particulates. In many instances of quantitative estimation, no other spectral media or chromatographic technique other than ultraviolet spectroscopy need be contemplated. An example of the chromatographic separation and identification of a typical air pollution sample is given. A slurry of activated alumina in cyclohexane was added to a 26.5 by 0.5 in. column to a depth of 23 in. A Manovia 3650 A hand ultraviolet lamp was used to locate fluorescent zones on the column and to follow the passage of the eluted material. A Beckman DK 2 split beam ratio recording spectrophotometer was used for the ultraviolet spectral analysis of the eluates.

7796 APTIC NUMBER 21776

Coenen, Wilfried
A SIMPLE, FLOW-SENSITIVE ARRANGEMENT WITH A THERMISTOR AND ITS TECHNICAL APPLICATION TO DUST MEASUREMENT. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(11): 16-22, Nov. 1969. 7 refs.

The suitability of thermistors for use as flow-sensitive probes was investigated, as well as their application in dust-concentration measurement devices. The volume of the air sample must be determined regularly when such devices are in

operation, and in some special cases a constant air flow is required. An arrangement sensitive to flow and equipped with a hot conductor is described which, as a result of its small dimensions and simple design, is particularly suitable for dust measuring instruments. The electric circuit of this arrangement is given and factors influencing the flow-sensitive signal, primarily airflow velocity, static pressure, and air temperature, are discussed on the basis of the results of measurements. Several possible applications of this thermistor circuit include measurement of flow profiles in the immediate vicinity of the pipe walls and automatic control for a variable flow resistance of the blower of a Gravikon.

7797 APTIC NUMBER 19401

Cole, John E., III, Richard A. Dobbins, and Hratch Semerjian
TIME-RESOLVED MEASUREMENT OF DROPLET SIZE AND CONCENTRATION IN CLOUD CHAMBERS. Brown Univ., Providence, R. I., Div. of Engineering, ONR Contract N00014-67-A-0191-0001, 25p., March 1970. 9 refs.
CFSTI, BDC: AD 702755

An optical method for measuring droplet size and concentration in a cloud chamber is reported. The technique is applicable to condensation studies conducted in Wilson cloud chambers. During the growth of the droplets, optical transmission is continuously measured by high-speed electronic equipment at two wavelengths. Interpretation of the resulting transmission versus time curves is made on the basis of Mie scattering theory. The appearance of oscillatory regions in the transmission curves is related to the primary oscillations of the scattering coefficient and indicates the presence of a nondisperse cloud. Two methods of data interpretation are discussed from which absolute values of droplet size and concentration are obtained. Final droplet diameters from 1.75 to 10.4 micron with corresponding concentrations from 1.8 million to 11,500 droplets/cc were measured in a cloud chamber. Because it can be applied with greater confidence than optical image forming techniques, apparatus of the type described is suitable for the absolute calibration of condensation-nuclei counters of various types.

7798 APTIC NUMBER 19707

Corcoran, J. F.
REPLICATION OF FLY-ASH PARTICLES FOR ELECTRON MICROSCOPY. Fuel, 49(3):331-334, July 1970. 6 refs.

A method is described for replication of fly-ash particles for electron microscopy which should also prove suitable for other fine powders. It involves the partial embedding of the previously dispersed fly-ash particles in a very thin layer of polyvinyl alcohol and the initial replication of the exposed surfaces of the particles with a sheet of softened plastic (acetyl cellulose). Because the particles adhere tenaciously to the film of polyvinyl alcohol, it is possible to strip away the plastic initial replica without removing more than a small percentage of the particles. A shadowed carbon replica is then prepared from the initial replica in the conventional manner. Observation of the replicas with the electron microscope permits examination of more particles in a given field of view, and the high magnification available permits study of the details of the particle surfaces beyond the limits of light microscopy.

7799 APTIC NUMBER 19188

Dalzell, W. H., G. C. Williams, and H. C. Hottel
A LIGHT-SCATTERING METHOD FOR SOOT CONCENTRATION MEASUREMENTS. Combust. Flame, 14(12):161-169, April 1970. 9 refs.

The validity of light-scatter measurements as a basis for determining soot particle size and concentration from point to point within a flame was examined in relation to measurements on a special propane burner. The monodisperse spherical particle model relied on in the past predicted scatter diagrams in poorer agreement with experiment than a cluster model presently developed. Both scatter diagrams and electron micrographs of collected soot support a chain-cluster model, which predicts in addition mass concentrations that are within a factor of 2 of those determined by total filtration. Soot concentration measurements were made on a turbulent acetylene diffusion flame to demonstrate the light-scatter technique in application to a turbulent system characterized by large background radiation. Soot particle size was uniform throughout the burnout region, and a soot burnout rate that was first order in soot concentration was deduced. These results are consistent with a burning model in which eddies of soot-containing gas mix with oxygen-rich eddies and the soot particles burn rapidly. (Author abstract)

7800 APTIC NUMBER 19697

Deardorff, James W.
DISCUSSION OF PAPER BY W. H. REGENER AND L. ALDAZ, 'TURBULENT TRANSPORT NEAR THE GROUND AS DETERMINED FROM MEASUREMENTS OF THE OZONE FLUX AND THE OZONE GRADIENT.' J. Geophys. Res., 75(21): 4184-4186, July 20, 1970. 7 refs.

In their 1969 paper, Regener and Aldaz describe an open box method for obtaining ozone flux at a ground surface. The method consists of placing an open box face down on the surface, injecting some ozone, and measuring the rate of decay within the box, where air is kept mixed by a propeller. From the rate of decay, the ozone flux to the surface is determined by a formula partially dependent on the value of a velocity constant (K). The value is used in calculating ozone flux outside the box. This evaluation of the method and the formula questions whether the value of K from the box approximates that of the environment. Also discussed are the applications of the formula and a simpler transfer formula used by micrometeorologists for ozone transport over various types of surfaces and at different wind speeds. A method is presented for making the Regener and Aldaz approach applicable to environmental conditions where the turbulent mixing rate is far different from that within the test box.

7801 APTIC NUMBER 21866

Domon, Toru, Yoshio Hamauzu, Shinichi Harima, and Yoshihiro Shigeta
SELECTION OF ODOR PANEL AND ITS DEVELOPMENT FOR THE INVESTIGATION ON PUBLIC NUISANCE DUE TO OFFENSIVE SMELL. (Akushu kogai chosa ni okeru paneru no sentei to ikuseiho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 5(12):714-717, Dec. 25, 1969. 2 refs.

A survey was conducted to establish general standards for an olfactory perception test, to test the ability of olfactory judgment, to test the ability to rank odors, and to test olfactory ability compared to group odor quality. Qualitative odor judgment examines the ability to tell one odor from another. Odor samples, chosen from both 'enosmophore' and 'kukosmophore' groups were given to 20 candidates each in two rooms with a time limit of five minutes. Consideration was given to the way odor samples could reduce olfaction fatigue, therefore odor samples grew stronger. The test included two questions in each odor group: the ranking of odor samples and the identification of odor samples. Results of the tests which were conducted twice with three month intervals showed 52.9% of the passing rate with 36 candidates of the total 68 candidates the first time, reaching 56 points as the passing mark. The highest passing rate was in the forties and the lowest in the fifties the first time; the second time, the forties marked a great deal inverse passing rate and the twenties attained the highest passing rate. The rate of correct response concealed the fact that the lower rate of correct responses found in 'kukosmophore' group was interpreted to mean that the odor group was harder to be ranked than the 'enosmophore' group. It was added that the number of candidates probably was not large enough to draw a conclusion.

7802 APTIC NUMBER 19110

Dravnieks, A., B. K. Krotoszynski, Joyce Burton, Anne O'Donnell, and T. Burgwald
HIGH SPEED COLLECTION OF ORGANIC VAPORS FROM THE ATMOSPHERE. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 24p., 1970. 4 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

A collection method is described for obtaining samples suitable for analysis of sub-ppb concentrations of heavier organic components in air. A commercial styrene-divinyl benzene copolymer with an extremely high surface area (over 300 sq m/g) was found to serve as an efficient adsorber of organic vapors from air. Not enough water was collected by the copolymer to interfere with the gas chromatographic analysis of the samples. Properties of collectors containing 5 g of this collecting material were explored. Sample handling methodology and a series of devices were developed for the transfer of collected samples to the gas chromatograph. Sampling rates up to 4 liters/min were feasible, and the sensitivity of the whole process using 10-liter air samples was 10 to the minus 10th power g/liter of air per component. For gas chromatographic analysis of outside air, increased sensitivity is demonstrated by taking larger air samples in analyzing for organic components less volatile than ethanol, as a polar contaminant, and pentane as a non-polar-contaminant. (Author abstract modified)

7803 APTIC NUMBER 20001

Dunn, John F., Jr., Arthur H. Foster, Don A. Lautman, Louis J. Nardone, John L. Swanson, and Joseph J. Zelinski
ON THE DESIGN OF AN INSTRUMENT TO USE FORWARD-SCATTERED LIGHT TO DETECT SMALL PARTICLES. (FINAL REPORT). Northeastern Univ., Boston, Mass., Contract F 19628-67-C-0187, Proj. 7667-01-01, AFCRL-69-0334, 27p., Aug. 15, 1969.
CFSTI DDC: AD 693557

Design criteria were established for an instrument using forward-scattered light to detect micrometeorite particles from 0.1 to 2.0 micron in size. The parameters considered included the size and optical properties of the particle, the speed of the particle relative to the instrument, the spectral intensity of the light source, the spectral quantum efficiency of the photosensitive detector, and those of the light collecting arrangement. A computer program for calculating the system response per unit time for any set of parameters is discussed. Due to the necessity of collecting scattered light over a wider angular window than had been anticipated, a conical collector would not work unless the dimensions of the instrument were increased to an unreasonable extent. Problems of collimating and focusing the scattered light should be minimized by the use of ellipsoidal or off-axis spherical mirrors. Also reviewed is the ballistic range developed to accelerate micron-size particles for ground testing of the particle detector.

7804 APTIC NUMBER 21919

Dyment, J.
USE OF A GOETZ AEROSOL SPECTROMETER FOR MEASURING THE PENETRATION OF AEROSOLS THROUGH FILTERS AS A FUNCTION OF PARTICLE SIZE. Aerosol Sci., 1(1):53-67, 1970. 11 refs.

Previous work in which the penetration of sodium chloride aerosols through fibrous filters was measured as a function of particle size using an electron microscope technique was extended and confirmed using a Goetz aerosol spectrometer. Reasons for selection and detailed description and calibration methods of this instrument are given; a graphical method was developed for deriving particle size distributions of polydisperse aerosols from density measurements of the aerosol deposits (spectrograms) obtained with the spectrometer. This method was used to derive size distribution of a methylene blue aerosol before and after passing through a glass fibre filter with a mean fibre diameter of 0.8 micron at a velocity of 2.5 cm/sec; the particle diameter for maximum penetration was in the range 0.15-0.20 micron. Size distributions cannot be obtained with great accuracy by this method because of approximations involved in making corrections for losses; the inevitable degree of indeterminancy inherent in the calibration and other factors. Nevertheless, once calibrated, the instrument is convenient for approximate determinations of aerosol size distribution in the range of 0.03-1.0 micron for radioactive or coloured

particulate materials. (Author abstract)

7805 APTIC NUMBER 21885

Eidtmann, Helmut and Volkmar Fleischer
INSTRUMENT FOR DETERMINATION OF THE DUST CONTENT IN FLOWING GASES, PRIMARILY OF THE SOOT CONTENT IN DIESEL ENGINE EXHAUSTS. (Geraet zum Bestimmen des Staubgehalts in stroemenden Gasen, insbesondere des Russgehaltes in Abgasen von Dieselmotoren). Text in German. (Robert Bosch GmbH, Stuttgart (Germany)) Swiss Pat. 450,765. 5p., Jan. 31, 1968. (Appl. July 11, 1967, 7 claims).

A dust measuring device is described which consists of a pump whose piston is moved into innermost position by compressed air entering laterally through a valve in the pump jacket. The piston is withdrawn by force of a spring, drawing in a certain amount of air or exhaust gas. A ball release is used to initiate this action. The filter paper strips can be replaced automatically. When the piston presses down two bolts piercing the filter retention ring, the clamp pressing the filter into its place is loosened, and a fresh piece of the rolled up filter strip is moved in. When the piston is released from its innermost position the clamp is tightened again. This method permits much faster filter replacement than the conventional method where a cap had to be opened manually.

7806 APTIC NUMBER 21652

Ekman, G.
QUANTITATIVE PRINCIPLES OF ADAPTATION AND RECOVERY. Karl Marx Univ., Leipzig (East Germany), Symp. Biokybernetik, 1st Interm., Leipzig, E. Germany, 1967, p. 141-146. 4 refs. (Sept. 19-22).

Adaptation and recovery were studied in the modalities of olfaction and vision. By developing scaling methods for measuring perceptual or subjective variables, an attempt was made to measure the sensory intensity as perceived by the observing subject. Subjects were exposed to a continuous flow of hydrogen sulfide in air, and estimates were obtained of the perceived intensity of odor at regular intervals. Results are shown graphically. With increasing time of exposure the perceived intensity diminishes until it becomes practically asymptotic after 10 minutes. An exponential function is given for the adaptation process. Measurements were also obtained during and immediately following recovery period, in which the trend was one of initially very rapid but successively slower growth. Full sensitivity was recovered after about five minutes. In the vision experiments, the subject's task was to estimate the brightness perceived by the dark-adapting eye in relation to the brightness perceived by the pre-adapted eye. Perceived brightness was seen to grow with the time of dark-adaptation according to two negatively accelerated curves intersecting at about 8 min. The data is described as the sum of two logarithmic functions.

7807 APTIC NUMBER 19106

English, John and Yoshiro Tokiwa
SCRUBBING EFFICIENCY OF A CONDUCTIMETRIC SO2 MONITOR. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 2p., 1970. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

Tests of a particular commerical model of sulfur dioxide conductimetric analyzer showed low collection efficiency; this efficiency, or the amount of pollutant reacting in the absorbing solution divided by the amount of pollutant entering the analyzer, should be 100%. In addition, the response was not linear. Test findings resulted in modifications of the analyzer, including a 4-in. longer column and a helix with additional turns. The air flow rate decreased from 4.7 liters/min to 2.35.

7808 APTIC NUMBER 21717

Esposito, George G.
GAS CHROMATOGRAPHIC ANALYSIS OF LACQUER SOLVENTS CONTAINING NAPHTHA DILUENT. Coating and Chemical Lab., Aberdeen Proving Ground, Md., AMCMC Code 502R.11.29500, Proj. 1T062105A329, CCL Rept. 274, 13p., Dec. 1969. 3 refs.
CFSTI, DDC: AD 699324

Gas-liquid chromatography is used for the identification and determination of lacquer solvents, as certain solvent types used in surface coatings tend to form free radicals when exposed to solar radiation. A column prepared from two very polar liquid phases, diethylene glycol succinate and N,N-Bis(2-cyanoethyl)formamide, will elute aliphatic solvents quickly, permitting the identification and determination of oxygenated and aromatic solvents which appear as well defined peaks in the latter part of the chromatogram. Distillation of solvent from the lacquer is required as a preliminary step and final analysis can be calculated on a weight or volume basis.

7809 APTIC NUMBER 19568

Estes, Frances L.
BIOCHEMICAL EFFECTS OF SIMULATED AIR POLLUTANTS. (PART II). Gulf South Research Inst., Baton Rouge, La., Contract 7-R01-AP-01153, 26p., June 30, 1969. 6 refs.

An apparatus for the constant delivery of constant concentrations of components in a carrier gas stream is described. Stability of the gas stream pressure is achieved by means of a nullmatic pressure regulator, which also delivers the pilot pressures for the reducing relays of the component gas streams. This in turn results in a stable ratio of flow rates of each of the gas streams. Rotameters with associated pressure sensors are used in the dilution-mixing units, and to insure turbulent flow and mixing, a small mixing chamber is also employed. Evaluation of the apparatus in the ppm range at flows of 0.1 to 1 l/min indicates reproducibility of concentrations with 1% and delivery of concentrations within the limits of available standards. For the

evaluation of biochemical effects of the photochemical reaction products, chromatographic techniques were investigated for the treatment of biological samples so that pyruvic, succinic, and malic acids can be quantatively determined. In addition, an analytical procedure utilizing infrared techniques is described for the quantitative determination of glutamic and alpha-ketoglutaric acids for samples containing 0.5 to 2 mg of the acids.

7810 APTIC NUMBER 21653

Parre-Rius, Francisco and Georges Guiochon
RAPID ANALYSIS BY GAS-PHASE CHROMATOGRAPHY. SEPARATION OF AN OXYGEN-NITROGEN-METHANE-CARBON MONOXIDE MIXTURE. (Analyse rapide par chromatographie en phase gazeuse separation du melange oxygene-azote-methane-oxyde de carbone). Text in French. J. Chromatog., 13(2):382-390, Feb. 1964. 12 refs.

By careful preparation of molecular sieve 5 A powder, it is possible to obtain much more efficient and permeable gas-liquid chromatographic columns than previously available. With such columns a mixture of O2, N2, CH4, and CO can be resolved in less than 15 sec. A granular molecular sieve is first pulverized to 315-400 micron and then elutriated in a countercurrent of water for 10 min. Next the sieve is crystallized and progressively dehydrated, after which it is activated by heating for 3 hrs at 80 deg, 12 hrs at 250 deg (1 mm Hg), and finally for 12 hrs at 400 in a current of dry air. The final heating almost completely desorbs any water retained in the sieve. Hydrogen is used as the carrier gas. In tests of a 1-m column, a separation was obtained in 13 sec at 100 deg and a flow of 400 cu cm/min.

7811 APTIC NUMBER 21838

Feldstein, M.
CARBON MONOXIDE AIR MONITORING IN RELATIONSHIP TO AIR QUALITY STANDARDS. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, Public Health Service, Washington, D. C., National Air Pollution Control Administration, and California Univ., Berkeley, 22p., 1970. 17 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

Methods currently available for the measurement of carbon monoxide are reviewed and their ranges, advantages, and disadvantages are subjected to comment. Techniques considered include infra-red spectrometry, gas chromatography, colorimetric methods, volumetric methods, oxidation to CO2, and indicator tube techniques. A nondispersive infra-red carbon monoxide analyzer is described for applications involving continuous air analysis for CO. Preparation of calibration standards is described, and the elimination of interference data pertinent to each method of analysis is discussed.

7812 APTIC NUMBER 21917

Ferran, G. H. and E. C. Hyatt
SIZE-SELECTIVE SAMPLING OF PLUTONIUM AND URANIUM AEROSOLS. Am. Ind. Hyg. Assoc. J., 31(3):282-289, May-June 1970. 13 refs.

A study was made to characterize aerosols of plutonium and uranium with a two-stage, size-selective sampler. The first plutonium area was sampled with a LASL-type cyclone air sampler using a membrane filter as a second stage with an adjacent membrane filter as a gross sampler. Gross and second-stage samples were alpha-counted to determine the 'respirable' fraction of airborne material. The second plutonium area and the uranium area were sampled with paired HASL-type 1/2-inch cyclone samplers using membrane filters as a second stage. By analyzing material collected in the cyclone and on the second stage, the fraction of the sampled material in the 'respirable' range was calculated. The results of sampling the second plutonium area with HASL-type 1/2-inch cyclones at flow rates of 18 and 9 liters/min indicate that both sampling rates give similar values for 'percent respirable' for this fine aerosol. Some samples were treated with MTA film to identify single alpha-emitting particles. Particle size measurements on these samples were made by alpha track counting and with a light-field microscope. (Author abstract)

7813 APTIC NUMBER 17430

Fontijn, Arthur, Alberto J. Sabadell, and Richard J. Ronco
FEASIBILITY STUDY FOR THE DEVELOPMENT OF A MULTIFUNCTIONAL EMISSION DETECTOR FOR AIR POLLUTANTS BASED ON HOMOGENEOUS CHEMILUMINESCENT GAS PHASE REACTIONS. (FINAL REPORT). Aerochem Research Labs., Inc. Princeton, N. J., NAPCA Contract CPA 22-69-11, Aerochem TP-217, 25p., Sept. 1969. 15 refs.
CFSTI: PB 188104

The reactions of common air pollutants, such as nitric oxide, nitrogen dioxide, and carbon monoxide with certain second reactants, such as ozone or O atoms, result in light emission. Measurements of the emission intensity can be used to determine the concentration of the pollutants. In a detector based on this principle, ambient air and the second reactant can be continuously flown through and mixed in a reactor under moderate vaccum. After calibration, a continuous record of the pollutant concentration can be obtained. Specific intensity to a given pollutant is obtained by a suitable choice of the second reactant and a light filter. An experimental study of the device concentrated on the detection of NO, using O3 as the second reactant. The lack of interference by other common air constituents and pollutants with the response of the NO/O3 system was established. The detector had a linear response from about 4 ppb NO to at least 100 ppm NO. Based on the experimental results and data for other chemiluminescent reactions, it is concluded that homogeneous chemiluminescence monitors can be developed for O3, NOx equals NO + NO2, and CO. (Author summary modified)

7814 APTIC NUMBER 19522

Fortak, H.

MATHEMATICAL MODELS FOR THE DETERMINATION OF IMMISSION IN AREAS OCCUPIED BY INDUSTRIAL AGGLOMERATES. (Mathematische Modelle zur Immissionsermittlung in industriellen Ballungsgebieten). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:145-156, 1970. 8 refs.

A mathematical multisource diffusion model is described, for use in simulating and predicting long-range immission values in industrial complexes. The input data consist of a complete official record of emission from the area involved, together with statistics on the meteorological parameters responsible for propagation. Although the model is Gaussian in principle, it is possible to admit the existence of a thermal inversion that imposes limitations at the upper end of the expansion area, or there is the possibility that emitted gases are transformed during their transport through the atmosphere, or the possibility of absorption at the earth's surface. Once the class of meteorological parameters responsible for the propogation has been classified, the model can be used to calculate a stationary field of ground immissions for every possible combination of this parameter, on the basis of the spatial distribution of the emissions. Once the frequency distribution of the meteorological parameter is known, a frequency distribution of concentrations can be directly derived for each point in the industrial complex area. With the help of the model, the frequency distributions are plotted for a large number of regularly spaced grid points and for a large number of time periods. These distributions are characterized by a large number of parameters, and each parameter is drawn as a system of isograss on a map of the area. This method was first used for the city of Bremen during the cold months of 1967-68, during which time measurements were taken of the wind at the points affected. Calculated and measured frequency distributions were in generally good agreement.

7815 APTIC NUMBER 19077

Freiland, R. S., A. C. Billetdeaux, and R. W. Lawrence
MULTIPURPOSE INFRARED DETECTOR FOR PROPELLANTS. Aerospace Medical Research Lab. (6570th), Wright-Patterson AFB, Ohio, AMRL-TDR-63-97, 67p., Dec. 1963.

A manual is presented giving the theory, construction, electronics, operation, and maintenance of an open path infrared analyzer that was developed as a toxic vapor alarm and control system and carries out analyses independent of sampling systems. Requirements were established for the instrument as follows: maximum path coverage of 250 ft, and minimum of 25 ft; transportable, easily set up and operated; capable of analyzing for nitrogen dioxide with detectability of 5 ppm, for unsymmetrical dimethyl-hydrazine at 0.5 ppm, for ethylene oxide at 50 ppm, and for hydrazine at 1.0 ppm; accuracy plus or minus 50%; span and zero drift minimized; and simple calibration. The instrument as developed is based on the Wair Detector, with a Nernst Glower as infrared source. The introduction into the beam of barium fluoride and lithium fluoride, as filters, alternately permits and rejects the flow of radiation between 7 and 13 microns into the detector. All four of the vapors to be detected have strong absorption bands in the 7.5-13 micron region and all are measured in this region. Results of instrument tests and evaluation are also given.

7816 APTIC NUMBER 19229

Fuhrmann, Hans
MODERN METHODS AND EQUIPMENT FOR MONITORING STACK EMISSIONS. (Moderne Messverfahren und Geraete zur Ueberwachung der Schornsteinemissionen). Text in German. Energie Tech., vol. 22:171-173, May 1970.

For the specific and quantitative measurement of sulfur dioxide and carbon dioxide emissions, continuous and discontinuous methods are available. The discontinuous volumetric Orsat principle, and continuous photometric and electroconductivity methods are reviewed. The Orsat principle, which is based on absorption of the specific pollutant to be measured in a selective absorbent solution, cannot be used for SO2 determination, but is well suitable for CO2 determination. The method has low equipment costs and is reliable. The accuracy is not very high. At constant pressure and constant temperature, the absorbed volume is directly proportional to the pollutant which is to be measured. The two continuous methods are likewise based on absorption of the substance to be measured. A specific change (either of the color or the electroconductivity) of the absorbent takes place. Both methods are used for determination of SO2. Infrared analyzers can be used for CO2, CO, and SO2 measurements. Their operating principle is simple; no chemical substances are required. The higher interference of water vapor is a disadvantage. The ultraviolet absorption method combines the advantages of the infrared methods with those of the electroconductivity and photometric methods. No chemicals are required, no interference by water vapor occurs, and the equipment is simple. However, the method can only be used for SO2 determination.

7817 APTIC NUMBER 19012

Goetz, Alexander and Olgierd J. Klejnot
FORMATION AND DECAY OF AEROCOLLOIDS BY ULTRAVIOLET RADIATION. (FINAL REPORT). Atmospheric Research Group, Altadena, Calif., Org/NAPCA Contract 2 RO1 AP 00543-03, ARG 7C PR-914, 85p., April 1970. 29 refs.

A method for tracing and recording reactive hydrocarbons in the atmosphere is described. Irradiating a steady flow of air for 6-60 sec with ultraviolet light converts gaseous hydrocarbons into aerocolloids, which can be elevated by measuring their light-scattering power. This process is greatly enhanced by traces of ammonia, by high humidity, and by nucleated matter, such as condensation nuclei or aerocolloids of impactable size. The evaluation of the aerocolloids was conducted by photometry under low-angle darkfield illumination on the microscope stage. Photochemical formation of aerocolloid from hydrocarbon is tied to the presence of an oxidant, such as ozone in this method. The relative reactivities of 16 representative hydrocarbons were studied and found to form a series, related to the molecular structure. Positive effects of added ammonia (strong) and sulfur dioxide (weak) were found and studied. (Author abstract modified)

7818 APTIC NUMBER 19521

Graefe, K.
DIFFUSION CALCULATIONS SUPPORTED BY SO2 MEASUREMENTS ON WATER SURFACES AND BUILDINGS. (Stuetzung der Ausbreitungsrechnung durch SO2-Messungen auf Wasserflaechen und Gebaeuden). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:168-179. 1970. 15 refs.

Recent findings growing out the 11-year study of atmospheric conditions in Hamburg, Germany, suggest a procedure for correcting calculations of stack height according to diffusion formulas, which at best provide only an approximation. The Hamburg measurements were originally made for the purpose of determining whether residences might be built at a given distance from a factory. The procedure was to place measuring equipment 230 meters from the stack and at an altitude of 40 meters for several months. In the winter of 1962-1963, measurements were made 9 km from Hamburg's most powerful emission sources, a comparison being made between values at 90 meters and 20 meters of altitude. The method growing out of this development of measuring techniques was found effective in locating several strong sources of sulfur dioxide, and the method was also applied to vehicular traffic.

7819 APTIC NUMBER 19530

Grim, E. F. and A. L. Linch
RECENT ISOCYANATE-IN-AIR ANALYSIS STUDIES. Am. Ind. Hyg. Assoc. J., vol. 25:285-290, May-June 1964. 9 refs.

The continued growth of the urethane foam industry has emphasized the importance of field testing the atmosphere in the vicinity of foaming operations to insure that isocyanate contamination of the air is held to safe limits. The original Marcali field kit is adequate for estimating TDI (toluenediisocyanate) down to 0.05 ppm. However, the revision of the Threshold Limit Value for TDI in air from 0.1 to 0.02 ppm in 1961 by the American Conference of Governmental Industrial Hygienists placed the TLV below the applicable limit of the field kit. An alternate test method, the Ranta Method, permits the simultaneous determination of TDI and TDI urea (3,3' -diisocyanate-4,4' -dimethylcarbanilide). Although this method was used in the laboratory to follow the original toxicological studies of TDI no test kit had been developed for field use. Isocyanates other than TDI are finding increased use in urethane foam formulations. Notable among these newer isocyanates is MDI (methylene-bis(4-phenylisocyanate)), for which neither the Marcali nor the Ranta method is directly applicable. The reagent and sample volumes for the Marcali method for the determination of toluenediisocyanate (TDI) in air were modified to accommodate the 1961 revision of the Threshold Limit Value (TLV equals 0.02 ppm). A lightweight, easily portable assembly which includes the 'Uni-Jet' Constant Rate Air Sampler, reagents, and a compact set of permanent liquid color standards for the range 0.01 to 0.03 ppm was developed for field surveys. A similar unit, modified to provide permanent liquid color standards in a visual comparator adapted to the required 10-cm light path, was completed for the Ranta determination of combined TDI and TDI urea. A satisfactory laboratory test, based on the Marcali method for TDI, was developed for traces of MDI (methylene-bis-(4-phenylisocyanate)) in air. The method easily detects 0.01 ppm MDI in a one cubic foot air sample.

7820 APTIC NUMBER 19580

Gruber, Charles W. and Charles E. Schumann
THE USE OF ADHESIVE-COATED PAPER FOR ESTIMATING INCINERATOR PARTICULATE EMISSIONS. J. Air Pollution Control Assoc., 12(8):376-378, Aug. 1962. (Presented at the Air Pollution Control Association Annual Meeting, 55th, Chicago, Ill., May 20-24, 1962.)

The reliability of using the 'number of particles per min' caught on adhesive paper as an indication of excessive incinerator emissions was investigated in tests of 14 incinerators with burning rates per hr of 25 to 1250 lb. In this method, strips of adhesive paper are wrapped around a glass jar that is then inserted into a stack for 30 sec. A minimum of three samples is collected: one at approximately one min after start-up, one midway through the burndown, and another toward the end of burndown. After the sample is collected, a two-in. square is cut from the adhesive and mounted on a slide for microscopic particle counting. From the average number of particles counted on random fields, the number of particles per sq in. is first calculated and then the number of particles per min. Test data show a close relationship between the adhesive-paper loadings and excessive emissions as indicated by citizen complaints.

7821 APTIC NUMBER 19832

Gyakushi, Nobuhiko and Keiichi Nisimoto
AN EXPERIMENTAL STUDY ABOUT EXHAUST MANIFOLD GAS SAMPLING METHOD FOR MEASURING THE SCAVENGING EFFICIENCY OF TWO-STROKE DIESEL ENGINE. (Diiseru kikan no sokikoritsu sokutei no tame no haikikannai gasusanpuringuho ni kansuru jikkenteki kenkyu). Text in Japanese. Nippon Kikai Gakkai Ronbunshu (Trans. Japan Soc. Mech. Engrs.), 36(283):454-465, March 1970. 10 refs.

An electromagnetic gas sampler was attached in the exhaust manifold of a two-stroke scavenging diesel engine. The precise set-up of the experimental and the analyses of data are diagrammatically presented. Mathematical calculations are performed to determine the scavenging efficiency, the concentration of cylinder gas in the sample gas, the flow rate of exhaust gas through the exhaust valve, etc. For medium and high loads, the experiment is very useful for measuring scavenging efficiency. The advantages of the method over the traditional method of sampling the cylinder gas are, for example, that sampling at the exhaust manifold avoids the decrease in the accuracy of measurement due to leaks in the sampling valve. Since the time taken for the mixing of the gases in the cylinder is longer, it is possible to sample the gas with average composition. The attachment of the sampling valve on the engine is much easier than on the cylinder heads. For low load, the method is difficult because the period in which only the cylinder gas can be separated for measurement is short and the limit of the application of the method is yet to be investigated.

7822 APTIC NUMBER 19122

Haberl, J. B. and S. J. Fusco
CONDENSATION NUCLEI COUNTERS: THEORY AND PRINCIPLES OF OPERATION. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 23p., 1970. 8 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30 - April 1, 1970.)

High concentrations of condensation or Aitken nuclei, which are solid or liquid aerosol particles in the general size range of 0.005-to-0.1-micron radius, probably are precursors of the visible aspects of air pollution. Detection and measurement of these invisible particles by optical techniques is effected by condensing water on the nuclei, thus creating droplets of visible size. The thermodynamics of droplet formation are reviewed, as well as optical techniques, data processing and readout, and calibration methods for condensation nuclei counters. Corollary techniques for aerosol sizing with the condensation nuclei counter involve the diffusion coefficient, mobility, and the equilibrium radius for condensation of water vapor. A nearly monodisperse aerosol of very small particles was generated, and measurements of concentration and size by various techniques were compared as the aerosol decayed. Test data were compared to computer-derived solutions. Results indicated a rough agreement between coagulation calculations and size measurements, suggesting that refinement of the devices and procedures may yield a usable approach. One of the promising applications of condensation nuclei counters is to detect the presence of gaseous contaminants in the atmosphere. Such an application would mainly require a device at the inlet to convert the gas molecules to particulate matter which can act as condensation nuclei.

7823 APTIC NUMBER 19903

Hall, F. F., Jr. and H. Y. Ageno
ABSOLUTE CALIBRATION OF A LASER SYSTEM FOR ATMOSPHERIC PROBING. Appl. Opt., 9(8):1820-1824, Aug. 1970. 19 refs.

Pulsed laser ranging systems are useful in detecting the height and thickness of turbid layers and clouds in the atmosphere. In order to obtain quantitative data on the backscatter function from laser irradiance backscattered from the atmosphere, the ratio of power transmitted to power received must be accurately known. No absolute measurements of power, optical system transmittance, detector quantum efficiency, or electronic gain are necessarily required. The technique of measuring the power ratio by irradiating a smoked or painted target of known diffuse reflectance at a fixed range is used to calibrate a complete lidar system. Relative area of the output power pulse is monitored by a fast response photodiode, and the relative area of the returned pulse is also recorded after passing through a filter of known high optical density. It is essential to control the temperatures of the laser rod and receiver interference prefilter to ensure proper spectral matching. Field experience gained using this technique is described, and examples of calibration measurements and backscatter functions for smog and cirrus clouds are presented. (Author abstract modified)

7824 APTIC NUMBER 21856

Hasegawa, T., Y. Kumazawa, and S. Hirao
AIR POLLUTION EMISSIONS FROM PLASTICS MANUFACTORIES (I). (Gohsei jushi kakoh kohjoh no hai gas yugai seiboon chohsa (Dai 1 poh)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):119, 1969. 1 ref. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

In order to examine nuisances caused by waste gas from synthetic resin processing factories, analytical methods for DOP, DPP, and DIBP in the waste gas were analyzed under similar working conditions to actual vinyl chloride processing works using a mixing roll to determine a suitable method in which samples are collected through a high-volume air sampler with 2 to 5 filter papers overlapped (Gelman type A filter paper). Samples for gas chromatography are obtained by extracting from a part of the filter papers by acetone. Analytical conditions for the quantitative analyses of these gases are as follows: column material - SE30; 3% coating; column length, 1.5 m; column temperature, 180 - 200 C; detector temperature, 200 C; and injector temperature, 220 C. In addition, 2 overlapped filter papers are able to collect more than 97% of waste gas. The concentration of plasticizer gas on the mixing roll agrees with the value calculated from the method of Frissell.

7825 APTIC NUMBER 21803

Hasegawa, Toshio and Yasumasa Yamada
DETERMINATION METHODS FOR SULFUR IN FUEL. (Nenryochu no ioubun no bunseki hoho ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(4):223-228, April 25, 1970. 5 refs.

Because the increased consumption of fossil fuels has increased the amount of sulfur in the atmosphere, an improved method must be found for determining sulfur in fuel. The bomb and combustion tube methods currently employed are laborious and time consuming. In this investigation, the accuracy of these methods was compared with that of x-ray absorption and coulometric titration. Five kinds of heavy oil and petroleum were tested for sulfur content. In x-ray absorption, a mixed solution of liquid paraffin and thiophenol was used for determining the working curve. Equivalent acrylic acid resin plate was prepared for the correction of x-ray intensity reduction by natural disintegration of source. In coulometric titration, the combustion of a sample in a crucible with 0.6 g of alumina powder (combustion controller) and with 0.5 g of pure iron powder (igniter) lasted 9 min, with titration begun 4 min after the beginning of combustion. Instead of following the Japanese Industrial Standard (JIS) for the bomb method, a glass filter was used for barium sulfate sediment and weighed after drying. A platinum rather than a quartz container was adopted to avoid incomplete combustion of samples. The combustion tube method was carried out according to the JIS. With two exceptions, the values for x-ray absorption were in good agreement with those for the combustion tube and bomb methods. The exceptions are attributed to the influence of metals. For all

samples, the values determined by coulometry agreed with those obtained by the bomb and combustion tube methods.

7826 APTIC NUMBER 19690

Hasegawa, Keishi
SULFUR STREAM ANALYSER FOR PETROLEUM. (Sekiyu iwotun no renzoku sokutei sochi ni tsuite). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Institute, Tokyo), 12(8):601-603, Aug. 1969. 5 refs.

A continuous measurement device for sulfur content in petroleum was developed in order to control the blending proportions and to monitor the sulfur content during the process of blending. The penetration intensity of X-rays from an Fe 55 isotope through petroleum is influenced by the hydrogen, carbon and sulfur contents of the material, whereas the beta-ray from Sr 90 is not influenced by sulfur content. The mathematical relationship between the intensity of the initial radiation, intensity of the penetrated radiation, the mass absorption coefficient, density, and the thickness of the sample material can be used to derive an equation that yields the sulfur content in terms of other known variables. The device is set up so that the radiation from the two sources penetrates the petroleum flowing through the sample cell. Penetrated rays are sensed in the Geiger counters that in turn send signals to the computation and operation circuitry and the sulfur content eventually appears in the recording device. Comparison of the results obtained by this device and those by means of the ASTM method showed that over a period of one year and two months the errors were no more than plus or minus 0.04%. The device can be applied to petroleum products ranging from light to heavy oil with the range of 0-4% sulfur content, density 0.78-0.94%, carbon-hydrogen content ratio of 6 to 9, and up to the maximum temperature of 110 C.

7827 APTIC NUMBER 21768

Heaton, William H. and Joseph T. Wentworth
EXHAUST GAS ANALYSIS BY GAS CHROMATOGRAPHY COMBINED WITH INFRARED DETECTION. Anal. Chem., 31(3):349-357, March 1959. 11 refs.

The need for analysis of individual hydrocarbons in automobile exhaust gas has led to the development of a more sensitive gas chromatographic technique. Using raw exhaust gas, a readable peak can be obtained from hydrocarbon concentrations as low as 1 ppm. The improved sensitivity is obtained by passing the effluent from the chromatographic column, first through a furnace to burn the hydrocarbons to carbon dioxide and water, and then through a nondispersive infrared analyzer sensitized to carbon dioxide. The improved sensitivity obviates the need for concentrating the hydrocarbons by condensing traps, and the effect of fuel composition on the hydrocarbon composition of exhaust gas was determined by this method. Results obtained with both commercial gasolines and pure hydrocarbons show that the exhaust hydrocarbon composition is dependent on the composition of the fuel. (Author abstract)

7828 APTIC NUMBER 19359

Hemeon, W. C. L., George F. Haines, Jr., and Harold M. Ide
DETERMINATION OF HAZE AND SMOKE CONCENTRATIONS BY FILTER PAPER SAMPLERS. J. Air Pollution Control Assoc., 3(1):22-26, Aug. 1953. 7 refs.

A method for evaluating and interpreting filter paper samples is described that can be usefully applied to the assessment of smoke and haze solids from chimneys. The method is based on calculating optical density from light transmission measurements of the quantity of particulate matter deposited on Whatman No. 4 filter paper. The quantity of smoke is defined by unit values (1 Coh) of the quantity of light scattering solids producing an optical density of 0.01. By reducing all results to multiples of 1000 linear feet of air, the concentration for any time period is described as so many Coh units per 1000 ft of air. Two assemblies for measurements of light transmission and an automatic smoke filter sampler, adjustable to any timing cycle, are described. The sampler employs a pump with a slow motion reciprocating diaphragm and has an aspirating capacity of 2.05 cfm. For sampling haze or smoke potential in stack gases, it is practical to dilute the raw gas stream with fresh air at a fixed rate. The rate of dilution is selected to reduce the temperature of the resulting mixture to some convenient low level, e.g., 100-125 F, and the dewpoint below that of the ambient temperature. A sampling tube to the smoke sampler supplies an aliquot stream to the filter paper.

7829 APTIC NUMBER 19700

Henderson, J. S.
PLANNING FOR AIR POLLUTION CONTROL. PART 2: AMBIENT AIR SAMPLING INSTRUMENTS, PROGRAM COSTS AND APPLICATIONS. Water Sewage Works, 117(7):IW/26-IW/30, July/Aug. 1970. 17 refs.

Ambient air sampling instruments, their associated installation and operating costs, and manpower requirements are summarized. The samplers considered include static samplers, self-timing devices, and continuous recording instruments. The importance of the proper application of the various samplers for obtaining accurate data at minimum cost is emphasized. A suggested sampling program for a remote, single source consists of four to five static dustfall and sulfation monitors and one to three semiautomated hi-volume and sequential sulfur dioxide samplers. Estimated 1970 total capital costs of the program are $4000 to $6000 and estimated annual operating costs are $3000 to $8000. For a multiple source or metropolitan situation, all costs would increase by a factor of two to three.

7830 APTIC NUMBER 19517

Hochheiser, Seymour and Lawrence A. Elfers
AUTOMATIC SEQUENTIAL SAMPLING OF ATMOSPHERIC H2S BY CHEMISORPTION ON MERCURIC CHLORIDE-TREATED PAPER TAPE. Environ. Sci. Technol., 4(8):672-676, Aug. 1970. 6 refs. (Presented at the Am. Chem. Soc., 157th Natl. Meet., Minneapolis, Minn., 1969.)

Concentrations of atmospheric hydrogen sulfide from 0.5 to 100 ppb can be conventiently monitored by use of automatic, sequential filter paper tape sampler and mercuric-chloride treated paper tape. This method is especially suited to field sampling because no liquid reagents are employed, the samples obtained are stable for long periods of time, and a single role of tape is sufficient for collecting consecutive 2-hr samples over a period of one month. Possible interference from seven gases was investigated: NO2, SO2, NH2, CH3SH, CH3-S-CH3, CH3-S-SCH3; and Cl2. Methyl mercaptan (at an H2S to mercaptan ratio of less than 1) and chlorine were the only gases that interfered, and chlorine interference is not considered to be serious. Effects of humidity and reagent composition, range and sensitivity, linearity of response, stability of exposed and developed tapes, and reproducibility were also investigated.

7831 APTIC NUMBER 21754

Hochreiter, Frederick C.
ANALYSIS OF VISIBILITY OBSERVATION METHODS. Weather Bureau, Sterling, Va., Systems Development Office Test and Evaluation Lab., Task 2153 51 101, ESSA WBTM TSEL 9, 41p., Oct. 1969. 25 refs.
CFSTI: PB-188327

A literature search was undertaken to provide background information on which to base future phases directed toward automated visibility observations. Instruments which produce visibility indications as a function of extinction or scattering are available, but they are restricted in that they have an unidirectional view and a limited sampling path, usually less than 1000 feet. Because of the degree of subjectivity in sensory observations, it is impossible to conduct an error analysis of them, but abstract variables, such as the observers' familiarity with the terrain and markers, background illumination, contrast, and the intensity of nighttime markers, all point to the need for a suitable alternative to the human element. Aviation interests can be considered as the primary users of visibility observations. The RVR observation is the primary visibility information presented to the pilot under low visibility conditions (less than two miles), and it is now used as one of the controlling factors for take-off and landing at airports. Prevailing visibility is reported at all times, and is used as one of the factors in determining whether an airport is operating under Instrument Flight Rules or Visual Flight Rules. It would appear feasible to use an instrumentally derived visibility value in an automatic or semi-automatic weather station, such as the AMOS-III-70, or to obtain an objective observation at manned stations if two concessions are made: it must be realized that the objective value in no way adheres to what is known today as prevailing visibility, and secondly, it is a point measurement, or at the best the measurement along a fixed path. Air pollution interests may not be satisfied. In determining the purity of the atmosphere, it may be important to know that the visibility is 10, 15, or 25 miles. A finer resolution may be needed than is proposed. Aviation observations are scheduled hourly; however, this frequency may not be needed by the air pollution user, in which case a special observation geared to his time scale could be provided. This could be at a greater time interval and appended to the aviation observation in such manner as additive data is at the present.

7832 APTIC NUMBER 19119

Hodgeson, James A.
CHEMILUMINESCENT METHOD FOR OZONE ANALYSIS IN THE ATMOSPHERE. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 9p., 1970. 4 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30 - April 1, 1970.)

In the method described, the air is pumped continuously across a chemiluminescent surface at a flow rate of about 0.6 liters/min. When ozone reacts at a surface of Rhodamine-B adsorbed on activated silica, chemiluminescence occurs at a wavelength corresponding to the dye fluorescence. The light emitted by the surface is collected with a photomultiplier tube, the resultant current being directly proportional to the relative ozone concentration passing over the surface. Calibration of the surface with a source of known ozone output allows the quantitative determination of ozone from the measured current. The method is primarily designed for the continuous, real-time detection of low concentrations of ozone in the atmosphere and in chamber-type reaction studies where specificity for ozone is required. Its main limitation is the slowly decaying sensitivity of the surface for ozone detection. In the normal mode of operation, with 1:5 dilution of the air sample, the range of detection is 0.005 to 2.0 ppm. Without dilution, detection range is from 0.001 to 0.4 ppm. Information is provided on sensitivity, interferences, accuracy and stability, apparatus, reagents, procedure, calibration, and calculation.

7833 APTIC NUMBER 21835

Hodgeson, J. A.
REVIEW OF ANALYTICAL METHODS FOR ATMOSPHERIC OXIDANTS MEASUREMENTS. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 24p., 1970. 38 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

Currently used oxidant measurement methods and instrumentation were surveyed with emphasis on how these techniques meet the requirements of the California air quality standard for oxidants. Available methods were classified as manual laboratory methods, batch techniques to determine long-term exposures, and continuous field methods. The most widely used laboratory procedure is the 1% neutral buffered potassium iodide method for the determination of ozone. This is also the reference method for air quality standards currently being established at the federal and state levels. It is simple and reasonably accurate but suffers from interference from sulfur dioxide, hydrogen sulfide, and carbon dioxide. Due to the

instability of the iodine produced, analysis must be completed soon after sampling, and skilled laboratory technique must be applied to obtain good precision at low levels of ozone. Alternative manual methods are attractive but require additional development. Batch methods of ozone determination sacrifice in accuracy to obtain simplicity. The two in current use, bubbler boxes and the rubber cracking method, are adequate for inexpensive survey methods and comparative qualitative data, but that is their limit. Continuous measurement instruments in use today are all based on the potassium iodide reaction and detection of the iodine product by either colorimetric or coulometric principles. They suffer the same interference problems as the manual iodine methods. Also, being based on a wet chemical reaction, their continuous operation presents some problems in maintenance and supply. Several methods under development are not wet chemical. They are continuous real-time systems designed for the specific determination of atmospheric levels of ozone. One of these, a surface ozone monitor utilizing a chemiluminescent approach, has been fabricated and six prototypes are undergoing field evaluation. Specific determination of ozone may also be accomplished by the use of ultraviolet absorption in the 260 millimicron region. A key question as yet unanswered, however, is whether the measurement of atmospheric ozone is a true measure of the atmospheric oxidant level.

7834

APTIC NUMBER 19932

Honma, Katsunori
MEASUREMENT METHODS AND DEVICES FOR AIRBORNE PARTICULATES. (Fuyufunjin no sokuteiho to sono kiki). Text in Japanese. Kukichowa To Reito (Air Conditioning Refrig.), 9(1):70-80, Jan. 1969. 14 refs.

Since the concentration of airborne particulates varies in space and in time, due consideration must be given to obtain a representative value. The measurement must not be subjective but objective in terms of obtaining the 'average' values. A method proposed by the 'committee for permissible concentration' of the Japan Society of Industrial Hygiene is explained in detail with respect to the range of particle size to be measured, choice of measuring points, determination of density, and instrumentation. Three types of instruments are being used, that is, those for concentration by weight, relative density, and particle number measurements. A filter, an electrical precipitator, or an impinger is used for weight measurement. The relative density is monitored by light scattering or absorption. For counting the number of particles, a filter, a dust meter of collision-adhesion type, or an electronic counter is employed. The particle-size distribution is determined by a geometric or dynamic method. An optical microscope or light scattering counter is employed for the geometrical determination. For the dynamic determination, a cascade impactor, aerosol spectrometer, or precipitation chamber method is used. Chemical analysis of the particle is done by phosphorescence analysis, colorimetry, or atomic absorption analysis. Crystal structure and reactivity with other materials are also determined.

7835

APTIC NUMBER 19624

Houser, R. A. and P. L. Chapman

EFFECT OF SAMPLING SYSTEM TEMPERATURE ON TOTAL HYDROCARBONS MEASUREMENT IN AUTO EXHAUST. J. Air Pollution Control Assoc., 13(11):535-537, Nov. 1963. 2 refs. (Presented at the Air Pollution Control Assoc., Annu. Meet., 56th, Detroit, June 1967.)

A common, but frequently overlooked, source of error in continuous analysis techniques is the sample conditioning equipment through which the sample must pass before it reaches the analyzer. This is especially true of dirty samples that are taken from a high temperature source, whose conditioning includes cooling, filtration, and condensation of water. These three changes describe the physical conditioning of auto exhaust samples when analyzed by a nondispersive infrared analyzer. The hydrogen flame ionization analyzer has been considered as a substitute for the infrared analyzer in determining total hydrocarbons in auto exhaust. Its broader response magnifies the effects of surface adsorption in the sampling system. The extent of sample adsorption was determined by allowing the sample system to equilibrate with exhaust gas, then switching to atmospheric air and recording the analyzer output in a fast response recorder. Response curves show considerable trailing at all temperatures, indicating that some adsorption occurred at 150 C. Many components in engine exhaust adsorb on metallic sampling system surfaces, resulting in increased response to changes in sample composition. Although temperatures as high as 150 C do not eliminate adsorption lags, they can be significantly reduced by high temperature operation.

7836

APTIC NUMBER 19405

Hunt, William F., Jr.
THE PRECISION ASSOCIATED WITH THE SAMPLING FREQUENCY OF LOG-NORMALLY DISTRIBUTED AIR POLLUTANT MEASUREMENTS. Preprint, Air Pollution Control Association, New York City, 21p., 1970. 7 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-19, 1970, Paper 70-99.)

Before establishing an air monitoring site, the field investigator must decide which air pollutant(s) he is going to measure and how he will measure them. After he has made these determinations, the investigator is faced with the problem of how frequently he should sample the air in order to characterize an air pollutant for a given time period and area. The question arises: How many days in a given time period should the air be sampled for a given confidence, say 95%, for example, so that the true geometric mean lies within plus or minus 10% of the sample geometric mean? The sampling period could be 1, 2, 3, or more months, or a year. By using formulas that determine the precision associated with the sampling frequency of log-normally distributed air pollutants, the field investigator is able to compare various sampling plans and analyze the interrelationships between the sampling plan, the standard deviation of the logarithms of the air pollution measurements, the population size, and the confidence level. With the formulas, an experimenter can determine the precision of a sampling plan for any level of confidence or period of time he desires. In this particular context, the population size is equivalent to the period of time being studied. All he needs to know is an estimate of the standard deviation of the logarithms of

the air pollution measurements or the sample geometric standard deviation. (Author introduction modified)

7837 APTIC NUMBER 19319

Hwang, Jae Y. and Fredric J. Feldman
DETERMINATION OF ATMOSPHERIC TRACE ELEMENTS BY ATOMIC ABSORPTION SPECTROSCOPY. Appl. Spectry, 24(3):371-374, 1970. 9 refs. (Presented at the 158th Meeting of the American Chemical Society, New York, Sept. 1969.)

Trace metallic elements of Cr, Ni, Mn, and Cu in atmospheric samples were determined by atomic absorption spectroscopy. Organic membranes coupled with a low volume of air sample were utilized to collect air samples since conventional glass fiber filters were unsuitable for this purpose. A sample preparation technique and flame conditions that improve accuracy of analysis are discussed. The procedure used to prepare unknown samples mainly involves the removal of organic matter from the particulate sample and the conversion of the metals to soluble salts by ashing the samples in a furnace at 550 C for 1 hr and by subsequent dissolution in HNO3 solution. All four trace elements under a lean air-acetylene flame condition have no maximum peak in their flame profiles; maximum sensitivity can be obtained near the top of the burner head. This indicates that lean flame conditions can be used for all four elements without optimization of the flame condition for different elements. (Author abstract modified)

7838 APTIC NUMBER 19721

Hyman, M. H.
COMPUTER APPLICATIONS IN AIR-POLLUTION CONTROL HAVE ADVANTAGES. Oil Gas J., 68(30):119-121, July 27, 1970. 5 refs. (Presented at the Western Gas Processors and Oil Refiners Association Meeting, Anaheim, Calif., 1970.)

Applications of computers for air-pollution control include source-test computations for flow rate and composition, computations of opacity of stack plumes and corresponding grain loadings, light-scattering calculations, and removal efficiencies of wet scrubbers as related to pressure drop. A computer program is especially advantageous for source testing where complex regulations are enforced, since the program remembers all ramifications of the regulations and will properly sort out all components of an emission, with reference to various sections of the regulations. With regard to opacity, use of a computer makes it possible to determine which substance in a multi-component effluent has the lowest Ringelmann number. As well as specifying design pressure drop for a scrubber, a computer will estimate investment costs and yearly operating costs and hydraulic horsepower requirements.

7839 APTIC NUMBER 19078

Iachetta, Fulvio A.

A RESEARCH PROGRAM TO ESTABLISH DESIGN CRITERIA AND DEVELOP AN AEROSOL ULTRACENTRIFUGE. (INTERIM REPORT). Virginia Univ., Charlottesville, Div. of Mechanical Engineering, NAPCA Contract 22-68-7, Rept. ME-3117-104-70U, 49p., Jan. 1970. 3 refs.
CFSTI: PB 190947

The design analysis, detail and component design, and fabrication of an aerosol ultracentrifuge are reported. Included are the design and construction of a suitable experiment including a suitable laboratory aerdol system, evaluation of mechanical performance, and experiments directed to the identification of significant parameters influencing particle deposition patterns. A preliminary design study was performed to determine the specifics of an ultracentrifuge capable of classifying particles with sizes in the range 0.05-1.0 micron with a throughput of 0.5 cu m/min while operating in the ambient. Design alternatives were studied with a nominal bowl inner diameter of 6.00 in. and a machine length of 30 in. Development of an experimental arrangement with sufficient flexibility to enable simultaneous study of internal flow patterns and mechanical characteristics of the system was accomplished while awaiting complete machine assembly. Procedurally, experimental evaluation of the dynamic behavior and stability of the centrifuge was expected to be essentially a by-product of the work directed to particle deposition analysis. However, concurrent evaluation of the mechanical and fluid mechanical characteristics was not possible. Serious dynamics and stability problems requiring solution before any sampling work could be undertaken required the better part of a year for solution.

7840 APTIC NUMBER 19605

Inoue, Eiichi
ON THE BLACKNESS OF STACK SMOKE PLUMES. (Entotsu kara deru kemuri no kurosa). Text in Japanese. Bull. Meteorol. Soc. Japan, vol. 8:1-6, June 1961. 13 refs.

The smoke stack plume is dealt with as a meteorological tool to measure the wind turbulence in the atmospheric surface layer. An equation is given expressing the side-view outline of the visible region of an average plume. The visible length, the maximum visible half width, and the position of the maximum width are computed from the equation. An empirical method is suggested for estimating other turbulent characteristics, such as the eddy life-time and the diffusion coefficient. The limit of the applicability of these relations is also considered, and it is shown that the visible length should be in the distance range of a few times the stack height. The blackness criterion of the Ringelmann Chart is symbolically expressed, and the i-th region grade is dealt with theoretically. The length is shown to depend on the wind velocity, thermal stability, and stack height, under conditions of the same source intensity. Based on these relations, some suggestions are made concerning modifications of the Ringelmann Chart method.

7841 APTIC NUMBER 20009

Jackson, Peter J., Walden E. Langdon, and Peter J. Reynolds
AUTOMATIC CONTINUOUS MEASUREMENT OF SULFUR TRIOXIDE IN FLUE GASES.

Preprint, American Society of Mechanical Engineers, New York, 9p. 1969. 5 refs. (Presented at the American Society of Mechanical Engineers., Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/APC-2.)

A new industrial instrument for continuous sulfur trioxide measurement in combustion gases is capable of automatic operation remote from the control and registration position. Components of the instrument are a sampling system and chemical analyzer and supply, control, alarm, and registration facilities. The principle of operation is the absorption of sulfur trioxide in an aqueous solution of isopropanol, reaction of the sulfate ions with solid barium chloranilate, and the photometric determination of the acid chloranilate ion. A response time of about 1 min and a sensitivity range of 0.02 to 250 ppm make the instrument suitable for most requirements of operational control, plant investigations, and independent research. Simple modifications enable the application of the instrument to be extended to higher and lower SO3 ranges.

7842 APTIC NUMBER 19247

Johnson, J. H., E. J. Sienicki, and O. F. Zeck
A FLAME IONIZATION TECHNIQUE FOR MEASURING TOTAL HYDROCARBONS IN DIESEL EXHAUST. SAE. (Soc. Automot. Engrs.) Trans., 77(2):1502-1515, 1969. 6 refs.

A heated flame ionization detector continuous sampling technique, and heated sample wires are employed for counting the number of carbon atoms present in the exhaust gas sample. The carbon atom count is then converted to hydrocarbon concentration (HCC) in units of ppm carbon by calibrating the instrument under identical flow conditions with a sample gas containing a known hydrocarbon volume concentration. Because HCC does not give a direct indication of the actual mass of total hydrocarbons emitted by an engine whose air-fuel ratio varies with operating conditions, more useful parameters are derived from the HCC: percent unburned fuel, specific hydrocarbon rate, and mass hydrocarbons per million cycles. These parameters are used to compute the mass of hydrocarbons per mile and mass of hydrocarbons per ton-mile. Single-cylinder engine hydrocarbon data for the effect of load, speed, and injection timing for turbocharged conditions are shown, and calculations are presented for vehicle emission parameters from engine laboratory emission data.

7843 APTIC NUMBER 19531

Jones, Lawrence R.
THE DETERMINATION OF 2-NITROPROPANE IN AIR. Am. Ind. Hyg. Assoc. J., 24(1):11-16, Jan.-Feb. 1963. 17 refs. (Presented at the American Industrial Hygiene Association Annual Meeting, 23rd, Washington, D. C., May 16, 1962.)

The nitration of paraffinic hydrocarbons produces a mixture of nitroparaffins, the composition depending upon the hydrocarbon used and the nitration conditions. A sensitive, specific method for secondary nitroparaffins (of which 2-nitropropane is the only one used commercially as a solvent) is presented wherein 2-nitropropane is decomposed to nitrous acid by treatment with concentrated sulfuric acid. The resulting nitrous acid is combined with resorcinol to form a deep red-blue color suitable for quantitative measurement at a wave length of 560 millimicron. Amounts as little as three to five micrograms may be determined with an expected accuracy of plus or minus 5% and a precision of plus or minus 1%. Primary nitroparaffins decompose to hydroxylamine under the conditions of the test and do not interfere with the determination of 2-nitropropane. Most secondary aliphatic nitroparaffins and most halogenated aliphatic nitroparaffins, where the halogen and the nitro group are attached to the same carbon, give the same reaction with resorcinol. A halogenated nitro compound, where the halogen and the nitro group are on different carbon atoms, reacts according to the nature of the nitro group. Thus, 1-chloro-2-nitroethane reacts negatively, and 1-chloro-1-nitroethane reacts positively. Aromatic halogenated nitroparaffins or aromatic nitroparaffins do not react. However, aromatic hydrocarbons that have an aliphatic nitroparaffin or aliphatic halogenated nitroparaffin side chain do react, if they are soluble in the water acid mixture. Phenol, orcinol, pyrogallol, and pyrocatechol were tested and developed a red-blue color. N-(1 naphthyl)-ethylenediamine dihydrochloride forms a red-blue color coupler. Oxidizing and reducing agents must be absent. (Author abstract modified)

7844 APTIC NUMBER 19486

Jung, R.
SAMPLING PROBE FOR THE MEASUREMENT OF DUST CONCENTRATION IN FLOWING GASES. (Gefabsonde zum Messen des Staubgehaltes in Stromenden Gasen). Chem. Ing. Tech., 41(10):620-625, 1969. Translated from German. Belov and Associates, Denver, Colo., 22p., May 6, 1970. (Presented at the Methods Engineers Annual Meeting, Stuttgart, Germany, Oct. 1-3, 1968.)

A sampling probe for measuring dust currents in ducts is described. The probe consists of a tube placed in the gas stream perpendicular to its longitudinal axis. The tube has an intake opening for measurements. From the current which goes around the tube, part of the dust which was originally directed toward the measurement opening is displaced beyond the rim of the opening and does not take part in the measurement. This component is theoretically calculated from the particle trajectories and experimentally determined from dust current measurements conducted in a vertical circular tube which rotates in the measuring section with radially arranged probes around the channel axis. In such an arrangement, the intercepted dust quantities represent average values of dust current density along the measuring circle. Results indicate that the application of the probe should be restricted to the so-called airborne transportation at moderate dust loadings.

7845 APTIC NUMBER 17732

Kamiyama, Hiroaki, Yoshitsugu Hasegawa, Hiromi Kambe, and Norichika Aoki
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 57. SELECTIVE

MEASUREMENT OF WASTE GASES BY GAS TRACER (IV) SELECTIVE MEASUREMENT BY FREON-12. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. 3 refs. Translated from Japanese. 4p.

The improvements in the selective measurement of waste gases, using freon as a tracer, and the method for testing are discussed. The injection device for freon was improved so that the operation became simple. The adsorption, desorption, and permeation of freon by polyethylene and saran were investigated with regard to the sampling bag. A saran bag proved to be the more suitable. The method of concentrating the sample was improved so that the sample was directly concentrated into a U-tube from the plastic bag. Contamination of air from the jointed parts of the U-tube was eliminated by adopting a particular way of piping. To examine the identical behavior of gas tracer and sulfur dioxide, the SO2 concentration and freon concentration were compared under the same conditions, and a satisfactory correlation was obtained. This method is believed to be promising for selective measurement of waste gases, since equal concentration curves of freon was drawn.

7846 APTIC NUMBER 21890

Kanasori, S.
COMPARISON BETWEEN NESSLER AND PYRIDINE-PYRAZOLONE METHOD IN MEASUREMENT OF ATMOSPHERIC AMMONIA. (Taiki chu ansonia sokooto-i ni okeleo Nessler hoh to Pyridine-Pyrozolone hoh no hikakoo kentoh). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):104, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The effects of interference on the Nessler method and Pyridine-Pyrozolone method for atmospheric ammonia determination were examined. Since it has been suspected that formaldehyde, the concentration of which has increased in cities, interferes with the Nessler method, the mixture of formaldehyde and ammonia in different proportions are tested by the Nessler method. As a result, with 0 to 0.1 ppm of ammonia and more than 0.2 to 0.5 ppm of formaldehyde, it gives higher absorption rates than without formaldehyde, either when these samples become turbid or not. Thus, some measures should be taken for the Nessler method to avoid formaldehyde or to correct values obtained. On the other hand, the method using Pyridine-Pyrozolone, which consists of mono pyrazolone-water solution and pyridine solution of pis pyrazolone (1 to 5), the latter of which is obtained by reaction of mono pyrozolone and phenyl hydrazine in alcohol, gives a little complicated procedure but fairly good sensitivity. The interference can be neglected if interfering ions have usual concentrations in air.

7847 APTIC NUMBER 17629

Kato, Tatsuo, Zensho Munakata, Tatsuji Takahashi, and Tomoaki Kawaguchi
OFFENSIVE ODORS. 6. A STUDY OF THE CONTAINER USED IN GAS CHROMATOGRAPHIC ANALYSIS FOR COLLECTING THE ODOR SAMPLE. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 4p.

An investigation of the container used in gas chromatography was conducted. The capacity of the collection container was 1 liter, and a glass vacuum collection container with a Teflon-glass screw cock was constructed. The cock had a vacuum O-ring, and the sample made contact with it when passing in and out. To test the stability of the container in the sampling process and preservation of materials of 100 ppm, hydrogen sulfide, mercaptans, and dialkyl sulfides were used as sample materials. Gas chromatographic analysis with a sample collection vessel of this type can be used as a standard method with an error of less than 6%, if the concentration operation begins within 5 to 7 hours.

7848 APTIC NUMBER 19831

Konno, K.
PARTICULATE MEASUREMENT METHODS AND THEIR NUMERICAL EVALUATION. (Funjin no sokuteisho to suchi no hyoka). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 7(6):19-33, 1969.

The general technical discussion of particulates begins with the different ways in which particulates can be classified. For example, particulates can be categorized into dust, fume, smoke, or fog/mist according to Drinker and Hatch. Particulates usually are either monodisperse or polydisperse. General characteristics of particulates are listed, such as rates of settling, diffusion and condensation, light scattering, electrostatic chargeability, adsorption to water, adsorption by heat, and collision. The general effects of the particulates on human health are enumerated. The discussion further develops into the particulate measuring methodologies. The atmospheric conditions as well as the positions at which measurements are taken must be taken into consideration in order to obtain meaningful results. The ASTM method of establishing sampling positions is introduced. Various methods and devices for collecting dust particles and measuring their absolute, relative and weight concentrations are discussed and detailed tables for measurement methods (specified by JIS) are introduced. Of the two tables, one is the direct measurement of suspended particles and the other is measurement by collection. Different ways to determining the physical characteristics of particles such as specific weight, size distribution, and solubility are given together with the analyses of particle components. Finally, there is a short discussion on the evaluation of the numerical values obtained in terms of the general human environment.

7849 APTIC NUMBER 21862

Koshi, S.
EFFECTS OF THE SAMPLING TUBE ON THE AEROSOL DETECTION. (Dohkan no aerosol nohdo ni oyobosoo eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):35, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The effects of the sampling tube on aerosol measurements are

examined; the knowledge on this aspect is less than that on collectors and detectors themselves. Lead particles of 0.3 and 0.7 micron in size generated in a high frequency oven are diluted appropriately and go through detector-I (a type digital dust meter), a sampling tube to be tested (5.8 mm and 10.5 mm inside diameter, vinyl chloride,) detector-II, a flow meter and a pump, in that order, with the flow rate of 2 to 35 l/min. The sampling tube is coiled ten times around a pipe (23 cm in diameter) to simulate bends in actual usage (7.24 m in total length). For both particles the particle transmission rate of the sampling tubes shows the maximum values at 20 l/min for the 10.6 mm tube and 10 l/min for the 5.8 mm one; the values for 0.3 micron particle are always larger than the ones for 0.7 micron. If these transmission rates are plotted against air velocities, both maximum rates occur around 4 to 6 m/sec. Lower rates at the higher velocities would be due to the inertia of particles. But lower values at the lower velocities are not likely to be explained by particle sedimentation. This experiment points out the important effect of the sampling tube on the sampling procedures.

7850

APTIC NUMBER 19096

Kostko, O. K.
USE OF LASER RADAR FOR INVESTIGATING ATMOSPHERIC PROPERTIES. Tr. Tsentr. Aerologa. Observ. (Moscow), no. 77:67-85, 1967. 18 refs. Translated from Russian. Joint Publications Research Service, Washington, D. C., p. 88-110, Oct. 22, 1968. CFSTI: JPRS 46,726

The possible uses of lasers in atmospheric studies are discussed on the basis of investigations reported in the literature. Theoretical computations are reviewed for laser radiation scattering cross sections, for reflected lidar signals for different types of scattering, and for detection of reflected signals. Modern receiving equipment can register reflected signals from aerosols and particles of meteoric origin at great altitudes, about 150 km; information can also be obtained on wind in the upper atmosphere and on certain ions. Pulsed gas lasers present a particularly promising method for atmospheric studies. The use of optical radar for sounding the upper atmosphere, determining water and oxygen concentrations, and studying atmospheric turbulence is discussed. Other possible uses of lasers include study of the size distribution of water droplets in a cloud or fog, direct determination of the rates of some aeronomic reactions such as photodetachment and photoattachment, wind velocity measurements, and studies of atmospheric density and temperature. The development of laser apparatus with solar pumping will permit the use of lasers in satellite meteorology.

7851

APTIC NUMBER 19715

Krichevtsov, E. A., N. A. Shirinkin, V. Ya. Nekhter, I. S. Kukuruznyak, A. T. Kitaev, and G. L. Shapoval
DYNAMICS OF GAS EVOLUTION AND OF DUST CONTENT OF GASES FROM 100 T BASIC OXYGEN FURNACES. Steel (USSR) (English translation from Russian of: Stal'), no. 2:99-103, Feb. 1970.

Investigations were carried out on 100 t converters at an iron- and steelworks to examine the laws governing dust emission and gas evolution when injecting metal with oxygen at 2-3 cu m/t/min through a four-hole lance position 0.7-1.8 m above a still bath. The results show that the gas offtakes must be designed for maximum gas evolution with a reserve capacity of not less than 20%. For calculation purposes, the rate of carbon-drop should be assumed to be 0.5% min, since any higher estimated rate will make the installations and operation of the gas offtakes considerably more expensive. Variations in the chemical composition of the dust extracted during evolution during various periods of the heat are discussed. An optimum program is suggested for varying the rate of blowing during a heat. (Author abstract modified)

7852

APTIC NUMBER 19501

Kunazawa, Y. and Y. Nogami
DETERMINATION OF HEAVY METALS IN AIR BY FLUORESCENT X-RAY ANALYSIS (I). (Keikoh X sen boonseki hoh ni ycroo taiki chu jukinzokoo no sokootei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):106, 1969. 2 refs. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The measurement of air-borne heavy metals by means of the fluorescent x-ray spectrometry, which can analyze without spoiling samples is presented. Through a high-voluse air sampler, iron, copper, lead, and manganese are collected on a Gelman type A filter paper, and zinc on a GB-100 filter paper; the former filter involves Zn in itself in a noticeable amount. Analytical conditions are as follows: target, W or Cr; 50 kv, 40 ma; detector, S.C.; crystal, LiF; path, vacuum for solid and air for liquid; spectrum; and Fe-K apha, Cu-K alpha, Pb-K alpha, Mn-k alpha, and Zn-K alpha. Calibration curves are first obtained by analyzing half of the filter paper by means of fluorescent X-ray spectrometry and the other half, by means of atomic absorption spectrophotometry or emission spectroscopy. Next, the other calibration curves are made from fluorescent X-ray spectroscopy of filter papers, to which are added internal standards of metal chelate compounds, such as complex salts of acetyl acetone with iron, copper, lead, and zinc. The analytical values from both curves agree satisfactorily.

7853

APTIC NUMBER 19924

Lafay, P.
ELECTRONIC SURVEILLANCE OF AIR POLLUTION. (Controle electronique de la pollution atmospherique). Text in French. Tech. Moderne, no. 2:51-51, Feb. 1970.

Philips has developed a monitoring system employing a network of sulfur dioxide detectors whose operating principle is that of coulometry. Average concentrations are calculated every hour at each measuring point, while this average concentration is defined in terms of 3 indexes: relative to the point of measurement, in terms of wind direction, relative to the time

interval between samplings. This system gives data independent of geographical or topographical features, so that changes in the values reflect only changes in atmospheric stability, provided that industrial emissions remain constant. The detector measures SO2 concentration by titration with bromine. Measurements are sent via telephone wires, with the aid of a device known as MTT (multitone telesupervision) to a center equipped with recording equipment and a computer.

7854 APTIC NUMBER 19084

Laufhuette, D. W.
PRACTICAL EXPERIENCE WITH DUST RECORDERS FOR CONTINUOUS MONITORING OF DUST EMISSIONS. (Betriebliche Erfahrungen mit registrierenden Staubmessgeraeten zur Dauerueberwachung von Staubemissionen). Text in German. Mitt. Ver. Grosskesselbesitzer, 49(1):15-23, Feb. 1969. 2 refs. (Presented to the VGB, Emissions Meet., Salzburg, Bielefeld, and Saarbruecken, 1968.)

Performance of dust measuring apparatus behind hard coal-fired boilers in power plants was tested, with the use of electroconductivity analyzers and transmissometers. Parallel gravimetric measurements were taken for comparison, while operating the boiler at a constant load of 110 tons steam/h for the entire test period. The same type of coal was used for all tests. Electroconductivity analyzers were found to operate reliably only at constant load, and to be incapable of adjusting to changing boiler loads with varying speeds and dust distributions. Dust was deposited between the sampling probe and the dust sensor, even when the heater was used to avoid below dew point temperatures. The ionization tube tended to be worn through friction of the dusts. Measurements were falsified through dust deposition in the return duct from the dust sensor to the cleaned gas duct. A correlation of the photometric measurements and the specific dust content existed, but a transfer of the found correlation to other similar plants was not feasible. Only the latter method was found to be suitable within certain limits (constant load etc.) for continuous dust monitoring in boilers.

7855 APTIC NUMBER 19250

Levaggi, Dario A. and Milton Feldstein
THE DETERMINATION OF FORMALDEHYDE, ACROLEIN, AND LOW MOLECULAR WEIGHT ALDEHYDES IN INDUSTRIAL EMISSIONS ON A SINGLE COLLECTION SAMPLE. J. Air Pollution Control Assoc., 20(5):312-313, May 1970. 7 refs.

A procedure is described for the measurement of aldehydes which permits all samples to be collected in a single collection solution (NaHSO3) and analyses to be performed on aliquots of the solution. Samples from an effluent gas stream are collected in impingers connected in a series, each containing 100 ml of 1% NaHSO3 and which are followed by and connected to an empty impinger, a dry test meter and a source of suction. The sampling flow rate is 0.5 to 1.0 cfm. Formaldehyde is determined by the chromotropic acid procedure, acrolein by the modification of the hexylresorcinol procedure, and C2-C5 aldehydes by gas chromatography. Data are presented on the concentration of aldehydes from a variety of industrial emissions. It is noted that under certain conditions an afterburner abatement device increases the concentration of aldehydes emitted.

7856 APTIC NUMBER 19150

Liebert, Curt H. and Robert H. Hibbard
SPECTRAL EMITTANCE OF SOOT. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TN D-5647, 12p., Feb. 1970. 10 refs.
CFSTI: N70-19178

The spectral emittances of thin layers of soot were experimentally determined over the wavelength of 0.35 to 14 micron and at the two temperatures of 300 and 670 deg K. The soot was deposited from a smoky flame on transparent and reflective substrates, and soot layer thickness and emittances were measured on these substrates by spectrophotometry. The experimental results are compared with the predictions of simplified classical radiation absorption theory and with Hottel's widely used empirical relation. The results indicate that good assessments of the emittances of soot over broad ranges of temperature, thickness, and wavelength can be obtained by use of either the classical theory or the empirical theory. (Author abstract modified)

7857 APTIC NUMBER 19208

Llewellyn, Peter M.
SAMPLE INLET METHOD AND APPARATUS FOR GAS ANALYZERS EMPLOYING A STORAGE COLUMN AND GAS SEPARATOR. (Varian Associates, Palo Alto, Calif.) U. S. Pat. 3,507,147. 6p., April 21, 1970. 6 refs. (Appl. Aug. 21, 1967, 9 claims).

Sample inlet system for gas analyzers are described. A storage column, which may be removed and transported, is used to contain gas samples. To analyzed a gas, samples are pushed out of the column by a carrier gas, through a separator, to a mass spectrometer or other analyzer. Advantages of this system over other previous ones are (1) its ability to time the input samples to the mass spectrometer, (2) several different samples can be stored in the same column at one time, and (3) the possibility of making a mistake because a vacuum lock is eliminated.

7858 APTIC NUMBER 19574

Lodge, James P., Jr., John B. Pate, and Helen A. Huitt
THE USE OF IMPREGNATED FILTERS TO COLLECT TRACES OF GASES IN THE ATMOSPHERE. Am. Ind. Hyg. Assoc. J., 24(4):380-387, 1963. 7 refs. (Presented at the American Chemical Society Meeting, Division of Water and Waste Chemistry, 142nd, Atlantic City, N. J., Sept. 14, 1962.)

The value, significance and advantages of the use of impregnated

membrane filters as collectors for traces of gases in the atmosphere are described. An experimental test set-up for evaluating flow rates was used to show that the Adzumi flow equation describes the flow of gas through a membrane filter. Equations are developed to describe the flow rate as a function of the pressure drop across the filter and to describe the porosity as a function of pore size. Considerations of the theoretical molecular collisions with the wall indicate practicability of the use of membrane filters as efficient gas collectors. (Author abstract)

7859 APTIC NUMBER 19280

Luckers, John
METHOD AND DEVICE FOR THE CONTINUOUS ANALYSIS OF THE COMPOSITION OF A GAS. (Centre National de Recherches Metallurgiques, Brussels (Belgium)) U. S. Pat. 3,504,521. 4p., April 7, 1970. 5 refs. (Appl. Oct. 23, 1967, 6 claims).

A device for the continuous analysis of a blast furnace gas is described. A gas analyzer, such as an infrared gas analyzer, generates signals, passes them to a calibration unit, and then to a recorder. Calibration units often have disadvantages arising from the principle used or the quality of production. Automatic adjustment of the gas analyzers has the essential feature that the characteristic curve of the calibration unit is modified as a function of the drift of the analyzer. The calibration unit establishes at least two points on a variable characteristic by analyzing separate standard gas samples. The analysis of one standard gas will correct the zero of the characteristic, while the gain characteristic of the unit is corrected while analyzing the other standard gas sample. The values of the standard gases are brought into correspondence with the established points, and analysis of the standard gases is repeated at intervals. (Author abstract modified)

7860 APTIC NUMBER 19186

Lutz, G. J.
POLLUTION ANALYSIS: A BIBLIOGRAPHY OF THE LITERATURE OF ACTIVATION ANALYSIS. National Bureau of Standards, Washington, D. C., Analytical Chemistry Div., TN-532, 29p., June 1970. 71 refs.

Literature in the field of activation analysis relating to pollution analysis is compiled and presented in numerical order by accession number. Appendices cross-index the accession numbers by author, element determined, matrix analyzed, and technique used. Twenty-three of the entries are in the area of air/atmosphere pollution.

7861 APTIC NUMBER 19811

MacDonald, John C. and Louis Haddad
ULTRAVIOLET SPECTROPHOTOMETRIC DETERMINATION OF NITRITE-NITRATE IN KOH. Environ. Sci. Technol., 4(8):676-678, Aug. 1970. 9 refs.

A method for the simultaneous ultraviolet spectrophotometric determination of nitrogen dioxide(-) and nitrogen trioxide(-) in aqueous potassium hydroxide was developed. The molar absorptivities of NO2(-) and NO3(-) at the analytical wavelengths of 301 and 356 nm are solvent dependent. Absorptivities of NO2(-) and NO3(-) at 301 nm decrease linearly with KOH concentrations, while the absorptivity of NO2(-) at 356 nm increases linearly with KOH concentrations. Accurate analyses require the correct molar absorptivities and the KOH concentration must be known. Equations for the determination of NO2(-) and of NO3(-) are presented which require the determination of KOH concentration and the absorbances of the nitrite-nitrate in 1-cm cell at 301 and 356 nm. The method was applied successfully to synthetic solutions from 0.5 to 7 M in KOH. (Author abstract)

7862 APTIC NUMBER 21977

MacVean, Stephen S. and Graham B. Wallis
EXPERIENCE WITH THE WICKS-DUKLER PROBE FOR MEASURING DROP SIZE DISTRIBUTIONS IN SPRAYS. Dartmouth Coll., Hanover, N. H., Thayer School of Engineering, 33p., Dec. 1969. 9 refs.
CFSTI: PB 189694

Advantages and disadvantages of the Wicks-Dukler Probe for measuring drop size distributions in a spray are reported. The probe technique gives results which are repeatable and are useful for determining some properties of electrically-conducting sprays. However, four significant deficiencies were noted. The recursive numerical technique developed by Wicks and Dukler contains an error which invalidates it as a data reduction scheme. Noticeable deviations between the probe technique and a slide sampling method were found. It was not possible to eliminate the effect of amplifier gain on the signal count rate. With low gain, small pulses were missed, whereas at higher gain, spurious signals were picked up. It was necessary to determine a range over which the result was relatively insensitive to gain, but this introduced some uncertainty and errors. Also, the influence of large drops is predominant. The results are relatively insensitive to the shape of the probability density function for droplets smaller than the most likely diameter. A simple method was devised for deducing the cumulative volume distribution as a function of drop size from the probe readings.

7863 APTIC NUMBER 19112

Mage, David T. and Jamshid Noghrey
TRUE ATMOSPHERIC POLLUTANT LEVELS BY USE OF TRANSFER FUNCTION FOR AN ANALYZER SYSTEM. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 12p., 1970. 3 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

Because air pollution analyzers do not produce an exact record of pollutant concentrations, a procedure was developed for determining the transfer function for a analyzer system. This

transfer function C(t), which is the response to a unit pulse, is applied to the recorded output to produce a record of the actual atmospheric pollutant concentration at the inlet to the system. The theory of transfer functions is revieved, and the equipment and procedure described. When monitoring is for concentration-duration type regulations, the instruments must be calibrated in a specified manner; once the transfer function is obtained, it is a relatively simple matter to write the computer program which will automatically generate true atmospheric values. In the cases of existing recordings of concentrations, it may even be possible to perform the computations to uncover violators who escaped detection in the past. The procedure is applied to the carbon monoxide analyzer of a California monitoring station. Results show that variations in peak heights of more than 50% can exist between actual and recorded values.

7864 APTIC NUMBER 21930

Major, J. R.
MASS SPECTROMETRIC ANLAYSIS OF CARBON MONOXIDE-NITROGEN MIXTURES. Talanta, 17(6):537-540, June 1970.

To permit the analysis of gas mixtures containing both carbon monixide and nitrogen, a single-focusing mass spectrometer was modified by the attachment of a small glass chamber into which a porcelain boat filled with Schuetze catalyst was introduced. This catalyst is a mixture of iodine pentoxide and sulfuric acid adsorbed on pumice. The mass spectra of a gas sample was recorded before and after the oxidation of carbon monoxide to carbon dioxide. As established by a series of tests, the method provides for the complete conversion of carbon monoxide to carbon dioxide under most experimental conditions likely to be encountered.

7865 APTIC NUMBER 19696

Mantis, H. T.
COMMENTS ON A PAPER BY I. ALDAZ, 'FLUX MEASUREMENTS OF ATMOSPHERIC OZONE OVER LAND AND WATER.' J. Geophys. Res., 75(21):4187-4191, July 20, 1970. 13 refs.

In the 'box' technique for measuring ozone flux at the earth's surface, flux is described by an expression which replaces all surface turbulent transfer characteristics by one constant that is the property of the surface alone. Since the box tests were made in light winds, the derived coefficient may underestimate flux by an order of magnitude in high winds and the applicability of the constant might be restricted to one particular surface. The contention that ozone flux beyond a certain turbulence is controlled more by the reaction rate at the surface than by the amount of available turbulent transport is explored, as well as its consequences for ozone flux studies near the ground.

7866 APTIC NUMBER 21730

Marshall, B. S. and R. Wood

A SIMPLE FIELD TEST FOR THE DETERMINATION OF HYDROGEN FLUORIDE IN AIR. Analyst, vol. 93:821-826, Dec. 1968. 6 refs.

A field method is described for determining hydrogen fluoride vapor in air at concentrations up to 20 micrograms of hydrogen fluoride per liter. The gas is collected in an acidic solution of zirconium-Solochrome cyanine R reagent and the observed bleaching of the color is compared with standards. The apparatus used is simple to operate and the time required for a determination is less than 5 min. However, in view of the interfering effects of aluminum and phosphate, the field test is not recommended for the testing of industrial atmospheres polluted with fluoride-containing dusts. (Author abstract modified)

7867 APTIC NUMBER 21807

Matsushita, H., A. Suzuki, Y. Esumi, and T. Handa
ANALYSIS OF CARCINOGENIC SUBSTANCES IN SOURCES OF AIR POLLUTION (I). DETERMINATION OF CARCINOGENIC HYDROCARBONS IN SOME TARS. (Osen gen chu no hatsoo gan sei booshitsuo no boonseki (I) Tar chu no hatsoo gan sei tankasooiso no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):110, 1969. (Proceedings of The Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

Aromatic compounds in tar can be separated from aliphatic ones into dimethyl-sulfoxide (DMSO) after mixing tar, cyclohexane, and DMSO. Neutral and acidic portions of aromatic compounds can be extracted from the above DMSO into cyclohexane after mixing with hydrogen chloride solution and cyclohexane. The acidic portion can be eliminated by adding sodium hydroxide solution to the cyclohexane. To separate carcinogenic hydrocarbons from it, two-layer-two-stage thin layer plate is used, which consists of an alumina G layer and a cellulose acetylated layer. Extracted samples dissolved into benzene are spread on the first layer using n-hexane-ether and then on the second layer using methanol-ether-water. Carcinogenic hydrocarbons are detected by their fluorescence under ultraviolet rays. Finally, the detected parts on the plate are taken out, extracted with benzene, and analyzed by means of fluorescent spectroscopy. Results are given for benzo(a)pyrene as 7.48 g/kg and benz(a)anthracene as 8.2 g/kg.

7868 APTIC NUMBER 19293

Matsushita, Hidetsuru, Yoshio Esumi, and Kunio Yamada
IDENTIFICATION OF POLYNUCLEAR HYDROCARBONS IN AIR POLLUTANTS. (Taikiosen funjinchuri fukumareru takan hckezoku tankasuiso no dotei). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 19(7):951-966, July 1970. 58 refs.

A method for identifying polynuclear hydrocarbons in particulates suspended in urban air is reported. It comprises the collection of the particulates by a Hi-volume sampler, the extraction of the polynuclear compounds by vacuum sublimation, separation of the extract by two-dimensional, dual band thin-layer chromatography, solvent extraction of each component, and identification of the

extracted solution by spectrofluorometry or spectrophotometry. Suspended particulates from Kawasaki air were analyzed by the method. The vacuum sublimation extract of the particulates was separated by the thin-layer chromatography into 76 fluorescent spots which corresponded to those of polynuclear hydrocarbons and their related compounds. Fifty-nine spots were analyzed and 30 polynuclear hydrocarbons and 1 aza-heterocyclic hydrocarbon were identified. The identified compounds that were newly detected in urban air included the following: 5,12-dihydrotetracene, 11H-naptho-(2,3-b)fluorene, 11H-naptho-(2,1-a)fluorene, ideno-(1,2,3-cd)pyrene, picence, tetracene, benzo(b)chrysene, tribenzo(a,c,j)tetracene, tribenzo(a,e,i)pyrene, dibenzo(a,i,pyrene), dibenzo(a,h)pyrene, benzo(g)chrysene, 1,2,3,5,6,7-hexahydrotrianqulene,and naptho(2,3-k)fluoranthene. It was also established that 12 active or suspected carcinogens were present in the air pollutants. (Author abstract modified)

7869

APTIC NUMBER 19109

Mayrsohn, Henry, Mutsuo Kuramoto, Ray Sothern, and S. Henry Mano
A GAS CHROMATOGRAPHIC-INFRARED SYSTEM FOR THE STUDY OF ORGANIC AIR BORNE PARTICULATES. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 10p., 1970. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

A gas chromatographic-infrared instrumentation system with a capability for pyrolytic analysis and sample isolation and collection is described, for application to particulate analyses where fairly large samples are readily available. The instrument system, consisting of a column oven, infrared spectrophotometer, collection unit, and pyrolyzer, may be used in any of the following analytical modes: as a gas chromatograph using thermal conductivity, electron capture, and flame ionization detectors; as a pyrolysis gas chromatograph using any or all of these detectors in any combination; as an isolation, preparative unit for the separation and retention of unknown substances under study; and as a GC-infrared combination whereby individual components of a sample may be scanned for infrared absorption bands.

7870

APTIC NUMBER 19108

Mayrsohn, Henry, Mutsuo Kuramoto, Ray Sothern, and S. Henry Mano
THE GAS CHROMATOGRAPHIC DETERMINATION OF C2-C10 HYDROCARBONS IN THE ATMOSPHERE, AUTOMOTIVE EXHAUST AND MOTOR FUELS. Preprint, California State Dept. of Public Health, Berkeley, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 7p., 1970. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

A gas chromatographic procedure for the rapid determination of C2 - C10 hydrocarbons from several sources having percent, ppm, and ppb concentration ranges is described. The method features the application of a column temperature program from - 40 to 175 C with a single Golay column and flame ionization detector. Depending upon the sample source, as many as 150 C2 - C10 paraffins, olefins, and aromatic hydrocarbons may be determined in 25 minutes. Equipment and operating conditions of the chromatographic method are discussed. In addition to the apparatus for gasoline or other liquid hydrocarbon analyses, a combination gas sampling and concentration device is added in order to perform reproducible, ultrasensitive gas analyses needed for auto exhaust and atmospheric hydrocarbons. Analysis techniques for gasoline, automotive exhaust and atmospheric hydrocarbons are illustrated. (Author abstract modified)

7871

APTIC NUMBER 21903

McElroy, Frank
THE INTERTECH NDIR CO ANALYZER. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 14p., 1970. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

A technical description is provided of a non-dispersive carbon monoxide analyzer. Its principle of operation is based on a two celled energy receiver, the cells of which are separated by a diaphram instrumented to detect diaphram displacement. Infrared beams from two matched sources are passed through a zero-CO reference cell and through the sampler containing the CO. Some of the energy is absorbed from the beam passing through the sampler by the CO. When the beams enter their respective receivers, the receiver temperature and hence pressure in the reference receiver is increased by a greater amount than those in the sampler receiver. The instrumented diaphram is displaced in the direction of the sample receiver and the amount of displacement is used as a measure of the contained carbon monoxide. The analyzer will measure CO continuously and calibrate itself periodically in unattended operation for days or weeks. Upon start-up, this analyzer requires several hours of warm-up and usually some electronic adjustments. The calibrator zero, span controls, and timer must also be set. Malfunctions are corrected by replacing defective modules or assemblies.

7872

APTIC NUMBER 19051

McGinnity, J. L., K. W. Grimley, Jr., C. H. Morres, Jr., and J. D. Mulik
MOBILE SOURCE SAMPLING LABORATORY FOR THE PULP AND PAPER INDUSTRY. Preprint, Public Health Service, Durham, N. C., National Air Pollution Control Administration, 12p., 1970. 7 refs. (Presented at a Symposium on Methods for Measuring and Evaluating Odorous Air Pollutants at the Source and in the Ambient Air, June 1-5, 1970.)

A mobile source-sampling laboratory for the pulp and paper industry is discussed. A continuously operating stack-gas-conditioning system has been devised for the laboratory. From the source, the gas sample first passes through a heated glass-

fiber filter to remove particulates, and then into a 3/16-inch-ID Teflon sampling line. The continuous gas monitoring instruments provide analysis for oxygen, carbon monoxide, carbon dioxide, hydrocarbons, and various sulfur compounds. Seven instruments are used: two gas chromatographs, a Melpar total sulfur analyzer, a Barton titrator, and a Beckman O2, CO2, and CO analyzer. Another part of the source sampling program is an odor panel. Samples are diluted in 100 ml syringes and presented to the panel directly from the syringe. Emission data are available for gas samples taken before and after the direct contact evaporators, recovery furnace precipitator, smelt dissolving tank, lime kiln scrubber, and multiple effect evaporator scrubbers.

7873 APTIC NUMBER 19171

Melfi, Samuel H. and Joseph W. Stickle
AIRBORNE LASER-RADAR STUDIES OF THE LOWER ATMOSPHERE. National Aeronautics and Space Administration, Langley Station, Va., Langley Research Center, NASA TN D-558, 56p., Dec. 1969. 30 refs.

In the present investigation, a theoretical model of ruby-laser radiation backscatter with a wavelength of 0.6943 micron in the lower atmosphere was developed. This model accounts for scattering from air molecules and atmospheric aerosols. Molecular scattering appears to predominate over aerosol scattering from 4 to 14 km. Above 14 km, an aerosol layer increases the scattering by approximately a factor of 2 above Rayleigh (molecular) predictions. An airborne laser system was also developed and flown from near sea level to 11 km. The results of the airborne measurements agree well with model predictions. The investigation obtained no correlation between molecular or aerosol density fluctuations due to clean-air turbulence and laser-radar return from the atmosphere. This finding does not preclude using laser backscatter systems as atmospheric probes, since the system employed was extremely insensitive to the detection of molecular or aerosol density fluctuations. An improved system should make the airborne laser studies a valuable tool for investigating atmospheric phenomenon associated with molecular and aerosol density changes. (Author summary modified)

7874 APTIC NUMBER 19027

Meysson, M. and T. Waldenstroem
PRESENT STATE OF THEORETICAL KNOWLEDGE ON RED SMOKE. (Etat actuel des connaissances theoriques sur les fumees rousses). Text in French. Centre Doc. Siderurg., Circ. Inform. Tech., 25(12):2663-2673, 1968. 16 refs.

Red dust emission of the Thomas steel plants were studied from the standpoint of chemical analysis, granulometry, and quantity of dust emitted. The sources of dust were analyzed by evaporation alone and by a combination of evaporation and oxidation. The most satisfying theory thus far developed is that of Turkdogen, Grieveson and Darken, who propose the following improvements: when using air, lower the temperature at the point of impact; when pure oxygen is used, increase the oxygen at the point of impact, so as to cause the rapid formation of an iron oxide inhibiting layer.

7875 APTIC NUMBER 19095

Mion, J.
COMMENTS ON THE USE OF THE ISOKINETIC PROBE. (Remarques sur l'emploi de la sonde isocinetique). Text in French. Informations Aerauliques et Thermiques (Paris), 5(18):19-22, Sept. 1968.

Isokinetic conditions are achieved when the flow rate of a gas is not modified by its entrance into a dust-sampling probe, which means that a simple zero reading of an isokinetic probe indicates such a condition is fulfilled. Tests of such a probe were conducted at CETIAT, using a nozzle with an outer diameter of 150 mm and inner diameters of 12, 16, and 20 mm to study the range of flow rates between 4 and 20 m/sec. The use of an isokinetic probe simplifies the practical problems involved in measuring the dust content of a gas, but requires careful calibration to avoid the introduction of systematic errors, which can amount to as much as 5-10% under unfavorable conditions.

7876 APTIC NUMBER 19343

Moffat, A. J. and A. B. Barringer
RECENT PROGRESS IN THE REMOTE DETECTION OF VAPOURS AND GASEOUS POLLUTANTS. Preprint, Mich. Univ., Ann Arbor, 43p., 1969. 8 refs. (Presented at the Symposium on Remote Sensing of the Environment, 6th International, Ann Arbor, Oct. 14-16, 1969.)

Recent progress in the development of correlation spectrometry techniques, as applied to various remote sensing tasks, is discussed. The techniques described enable accurate quantitative measurements of diffused atmospheric gases, such as sulfur dioxide and nitrogen dioxide, by using controlled light sources. Accurate quantitative measurements of gas clouds can be made by using solar illumination, which also allows semi-quantitative measurements of well diffused atmospheric gases. Specific applications of these techniques are described, including preliminary results of a high altitude balloon experiment. This experiment was designed to test the feasibility of measuring pollution at the earth's surface from high altitude balloons and satellites. (Author abstract modified)

7877 APTIC NUMBER 19292

Moore, Wiley
RADIATION SENSITIVE SMOKE DETECTING DEVICE. (Bliss (E.W.) Co., Canton, Ohio) U. S. Pat 3,505,529. 4p., April 7, 1970. 5 refs. (Appl. Feb. 8, 1968, 4 claims).

A device for detecting and announcing the presence of smoke particles in air flowing through it is described. Photoelectric cells were used in the past as the actuating means for the alarm system. Some sort of light emitting means is disposed in the

device so that light rays reflected from smoke particles actuate the cell and thus create a signal. However, these devices have presented many problems, such as the entry of particles other than smoke and the illumination of the photoelectric cell in the absence of smoke. The improved device has a porous body with a cavity and a number of recesses extending outwardly from the cavity. A lamp is situated in one of the recesses and light rays are emitted across the cavity. A normally non-illuminated photoelectric cell is mounted in another recess and shielded from the light rays emitted by the lamp. Air flows through the porous body walls, and when smoke is carried into the cavity, light rays are reflected from the particles to actuate the photoelectric cell.

7878 APTIC NUMBER 21855

Mori, M., S. Ito, and H. Ogino
AUTOMATIC MEASUREMENT OF HYDROGEN FLUORIDE IN AIR BY COLORIMETRIC METHOD. (Taiki chu fookka sooiso no ienzokcc sokootei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):113, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The automatic measuring method of a small amount of fluorides developed by Adams et al (1959), which uses a zirconium-eriochrome cyanine-R method modified by Megregian is modified to reduce sampling volume through an increase in sensitivity of the colorimetry. To do this, a little lower dosage of reagent is used than the original method, a concentration of hydrochloric acid which gives a relatively small variation in the absorption spectrum of the agent, and 556 millimicron of the measuring wave length for the instrument. The time-variation of the indicated color is stable enough to permit intermittent measurements in an hour. As far as interferring substances are concerned, Al(3)(+) and CO4(2)(-) do not give any significant influence for the measurement in air.

7879 APTIC NUMBER 19490

Moroz, W. J., V. D. Withstandley, and G. W. Anderson
A PORTABLE COUNTER AND ANALYZER FOR AIRBORNE DUST. Rev. Sci. Instr., 41(7):978-983, July 1970. 15 refs.

A prototype monitor for mine atmospheres, foundries, factories, or urban atmospheres is designed to detect, count and size-discriminate solid particles between 0.5 and 10 micron. The instrument operates on the basis of (visible) light scattering by individual particles. Battery operation, solid state circuitry, and miniaturized optical design allow the entire instrument to be housed in a briefcase. Total weight is less than 7 kg and total power consumption is less than 33 W. The shape of the hole edges and the conduits and the location of critical flow channels within the photometer head permit stable flow of aerosol past the light field volume where light scattering takes place. A photomultiplier tube receives the pulses of scattered light, which is viewed at an angle of 135 deg. The pulses, height discriminated and continuously integrated, activate milliameters representing particular size ranges and calibrated in numbers of particles per cu cm. (Author abstract modified)

7880 APTIC NUMBER 19431

Monier, Benjamin
FEASIBILITY STUDY ON ANALYTICAL TECHNIQUES FOR DETECTION OF GLYCOL VAPOR. (FINAL REPORT). Inst. for Research, Houston, Tex., Contract NAS 9-7570, 54p., Aug. 1, 1969.
CFSTI: N70-20062

A specific analytical technique for glycol vapor was developed. It is based on the fact that ethylene glycol is readily oxidized by periodic acid to formaldehyde which may be specifically determined colorimetrically without any interference by its reaction with a substituted catechol compound. The color development is enhanced by an acid precursor which is adsorbed into a specially purified grade of silica gel. Quantitation of the amount of ethylene glycol is made by rapidity of color development as well as rate or movement of the color band. The proposed system is specific for ethylene glycol and the catechol, dimethyl ether, gives a well defined lavender band which is extremely sensitive to ethylene glycol. An extensive compilation of the physical and chemical properties of both ethylene glycol and silica gel are included.

7881 APTIC NUMBER 19504

Mozan, C., A. Lacquaniti, and L. Pettinati
EVALUATION OF THE RISK PRESENTED BY INDUSTRIAL POISONS. (Evaluation du risque induit par les toxiques industriels). Text in French. Arch. Maladies Profess. Med. Trav. Securite Sociale, 31(3):141-146, March 1970.

The determination of the actual concentration of a pollutant in air leads to accurate, reproducible results only when certain factors that affect it are taken into account. Thus, as in processing a sample of polluted air, the pollutant must be absorbed completely by the absorbent used in its determination. It is essential to know that the bubbling rate of the air sample through the absorbent liquid has a significant effect on the amount of pollutant absorbed in the process. A potential source of incorrect interpretation of results of perhaps otherwise accurate measurements is the assumption of a uniform distribution of the pollutant throughout a given enclosed space while its actual distribution is nonuniform. These two findings and those to follow are illustrated by results of measurements of concentrations in air, in mg/cu m of hydrochloric and hydrocyanic acids, ammonia, sulfur dioxide, and trichlorethylene. Another important factor was discovered after a small hermetically sealed test room had been constructed for experiments in an atmosphere with known pollutant contents. Their measured actual contents in the test-room air were appreciably smaller than the theoretically expected ones. Analogeous results were obtained when air samplers were taken by small Draeger tubes and when the masonry walls of the test room were replaced by walls made of aluminum sheets. That some of the pollutant introduced into the air of the room is deposited on the walls was fully confirmed by a test in which an aluminum plate of known surface area was attached to the wall and the amount of pollutant deposited on it during the test was

determined analytically. When 'flushed' with fresh air this amount progressively decreased, as expected. Such 'contaminated' walls may act as secondary sources of air pollution.

7882 APTIC NUMBER 19107

Mulik, James D.
CONTINUOUS DETERMINATION OF SULFUR DIOXIDE WITH THE FLAME PHOTOMETRIC DETECTOR. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 9p., 1970. 7 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

In the method described, air is pulled continuously into a hydrogen-rich flame at a rate of 0.2 liters/min. From the light emitted when sulfur compounds in the ambient air are introduced into the flame, only the light of wavelength 394 millimicrons passes through a narrow-band optical filter to strike the photomultiplier tube. The current produced by the tube is amplified by an electrometer, and the magnitude of the response is read on a potentiometric recorder. The method is applicable to determination of total sulfur compounds or of sulfur dioxide. The range is from 0.005 to 10 ppm SO2; sensitivity is 6.0 times 0.00001 microliters/sec or 1.1 times 0.001 micrograms/sec. Interference from compounds other than SO2 is usually small, but in regions where concentrations of other sulfur compounds are appreciable, hydrogen sulfide and mercaptans are removed with selective scrubbers that allow SO2 to pass quantitatively. Details of the stability, apparatus, procedures, analysis, calibration, and calculations are given.

7883 APTIC NUMBER 19306

Nakaaki, Kenji
EVALUATION OF CARBON MONOXIDE EXPOSURE BY ANALYSES OF EXPIRED AIR. (Kokichu CO nodo niyoru CO bakuro hyoka nitsuite). Text in Japanese. Rodo Kagaku (Journal of Science of Labor), 46(7):422-430, July 10, 1970. 9 refs.

Investigations were conducted into the validity of evaluating carbon monoxide exposure by means of expired air analyses. The method is based on the close correlation between the CO concentration of expired air and the percentage of blood carboxyhemoglobin. Collections of expired air were made by the 20 second breath holding method, and analyses of CO were made with Kitagawa's CO detection tube. Between the results of the detection tube method and infrared analysis, a correlation coefficient of r equals 0.983 was obtained. Measurements of CO concentration in expired air were made with several subjects experimentally exposed and with workers exposed to CO their places of occupation. The CO concentration in expired air corresponded to 40-60% of the CO concentration in the ambient air after one to two hours of exposure. No increase was observed in exposures longer than two hours when the CO concentration in the ambient air was under 50 ppm. The CO concentration in the expired air was higher after two hours of exposure when the concentration exceeded 60 ppm. The carboxyhemoglobin percentage in workers, estimated from CO in the expired air, was increased by 1-2% after two hours exposure to 10-15 ppm CO, and by 4-5% after two hours of exposure to 30-40 ppm. (Author abstract modified)

7884 APTIC NUMBER 17641

Nakagawa, Fumiyuki, Shoji Kuwata, Hiroyuki Sugiyama, and Tsutomu Yoshioka
OFFENSIVE ODORS. 20. OFFENSIVE ODOR MEASUREMENT BY THE SALINE SOLUTION EQUILIBRATION METHOD. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 3p.

With respect to the saline solution equilibration method for measuring offensive odors, such factors as kind of odor, its concentration, draft volume, draft time, and filter were studied. The odor emitting substance was put in a sample bottle, aerated, and the offensive odor gas was absorbed in saline solution. When the solution was saturated and reached equilibrium, the concentrations in the first and second absorption bottles were presumed to be equal and maintaining a definite concentration. The dilution multiple when the saline solution was diluted with pure, odorless water until the odor disappeared, represents the degree of bad odor. Some substances which readily dissolve in water do not reach saturation in 4-5 hours. Ammonia reaches equilibrium in 2-3 hours, but draft volume effect seems to be fairly large. It seems to be questionable as to whether a general standard for the length of time required can be established, since the time to reach saturation varies with substances and concentrations. The attainment of saturation and equilibrium can be assumed when the concentration in the first absorption bottle has become constant. A comparative examination of glass filters and commercial diffusers was conducted, but no great difference was observed.

7885 APTIC NUMBER 21858

Nakagawa, F., S. Kuwata, H. Sugiyama, and K. Obata
THE MEASUREMENT OF ODOR WITH PORTABLE ODOR ABSORBING APPARATUS. (Shuken kinoshita shiki shuki sokootei schchi ni yoloo shukido sokootei (III)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):117, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A portable odor level determining instrument has been constructed; some experiments were conducted to know the range of its application and the relationship between measured odor level and the concentrations of the sources. This instrument, in priciple, gives the odor level in terms of a multiple of dilution when the liquid, which originally odorless (pure water), has absorbed the odor and reached the equilibrium with it, and loses its odor by dilution with odorless liquid (pure water, again). Hydrogen sulfide loses its odor too quickly to measure the odor level. For methyl mercaptan, odor levels are 40, 80, and 200 for source concentrations of 1, 2, and 3 ppm, respectively. Diethyl sulfide gives 100 odor level against 300 ppm of concentration. As a result, this instrument standardizes the odor measurement and would be used for amines, ammonia, and mercaptans. However, odors from matter insoluble in water or ones not easily absorbed have

to be studied. In addition, the data on the relationship between sources and odor level has to be obtained.

7886

APTIC NUMBER 17639

Nakamura, Ken, Shozo Fukuda, and Harumi Hirayama
OFFENSIVE ODORS. 18. OFFENSIVE ODOR MEASUREMENT BY DETECTION TUBE. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 4p.

The measurement of offensive odor constituents by the detection tube method is widely used. An investigation was conducted to determine the best conditions for measurement. Measurement conditions are being established to compare deodorizers of the direct addition type. The odor emitting source was put in the container of the device (a brown 2 liter bottle), a deodorizer was added, and air was introduced at a velocity of one liter/minute. The time when the flow began was made the starting time, and after a certain period of time, the aspirator was stopped. The odor volume was immediately measured by the detection tube. Sample material to which no deodorizer had been added was treated in the same way. As sources of odor, ammonia, hydrogen sulfide, ethylmercaptan, and raw urine were used. The deodorizers were two types of powder, and three types of liquid. Considerable differences occurred, depending on the deodorizer. In the case of oily substances, the effectiveness of deodorization by entrapment of odor was quite high, being more effective than the deodorizer itself.

7887

APTIC NUMBER 17729

Nakasa, Hiromichi and Hironori Ono
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 54. A METHOD FOR TRACING WASTE GASES BY MEANS OF COBALT SULFATE TRACER. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 5p.

Finely powdered cobalt sulfate was used as tracer for waste gases. A spraying device was developed which releases large amounts of tracer in a stable spraying flow. A dust sampler using a vacuum pump driven by a gasoline engine was prepared for use at the collection place where no commercial electric source was available. Other samplers for use in diffusion tests on a small scale were also studied, and a smaller and lighter sampler was developed which operates automatically. The tracer, Co(60), was determined by using a gamma-gamma coincidence counting method. This method can be used to trace waste gases from any source. It was developed to trace waste gases from a tall chimney, which gives a high diffusional dilution rate, in an industrial area where air pollution is very great. The determination of the tracer requires very little labor, so that the analysis time is shortened. The stability and accuracy of analysis are high. The radioactivation analysis allows the simultaneous analysis of many other elements, so that it can furnish information concerning the varying air pollutants with time and the district.

7888

APTIC NUMBER 21712

Neuhaus, Walter and David M. Goldenberg
VEGETATIVE REACTIONS AFTER OLFACTORY STIMULATION. (FINAL TECHNICAL REPORT). Erlangen-Nuremberg Univ., Erlangen (W. Germany), Medizinische Klinik mit Poliklinik, Contract DA-91-591-EUC-4014, Proj. 2M061102B71D, 8p., July 1969. 14 refs. CFSTI, DDC: AD 697162

Galvanic skin resistance, arteria radialis pulse and blood pressure, respiration, and stomach motility were recorded electrochemically in man after olfactory stimulation. In most cases, skin resistance decreases rapidly and returns gradually to its original value, frequently with temporary decrements in between. Arteria radialis pressure often shows a decrease, followed by a wavy pattern of alternate increments and decrements, before returning to its original value. Pulse frequency and amplitude are hardly affected. Respiration often becomes deeper during stimulation with pleasant odors, while its amplitude decreases with unpleasant odors; however, a partial increase of the respiratory amplitude with unpleasant odors was observed in some cases. Stomach motility generally increases in the form of increased amplitude of contraction, persistent contraction, or increased frequency of contraction. The largely autonomous cycles of the parameters investigated are concluded to be affected by olfactory stimuli, the effects depending on the particular conditions prevailing in the autonomic nervous system at the time of stimulation. (Author summary modified)

7889

APTIC NUMBER 21804

Nogami, J and T. Mizoguchi
COMPREHENSIVE CONTROL SYSTEM OF AIR POLLUTION. (Taikiosen no sogokanshimo). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 8(1):28-33, April 1, 1970. 12 refs.

A computerized air pollution control system started operation in 1968 in Osaka Prefecture. Air pollution and meteorological data are sent to a central surveillance office from 19 observation stations every 10 min by digital telemetering. At the office, the data are fed to an on-line computer. The computer processes them on a real-time basis. Warning signals are sent by wireless to factories. The observation stations are divided into stationary, mobile, and vertical distribution monitoring units. The fixed stations monitor sulfur oxides (by electroconductivity analysis), atmospheric particulates (by digital meters), wind speed, wind direction, temperature, and humidity. The mobile stations additionally monitor carbon monoxide, hydrocarbons, and nitrogen oxides. One on-line data processing program is included for checking abnormal data and mean-value computation. The present system, however, is one of feedback control; it should be replaced by a feed forward control system to achieve preventive air pollution. A block diagram of prediction system of pollutants concentration has been worked out, based on a mathematical model of air pollution. Accuracy of the model is being improved through a simulation computation by off-line operations.

7890 APTIC NUMBER 19117

Noll, Kenneth E.
PREVAILING VISIBILITY AS AN AIR POLLUTION MEASUREMENT. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 6p., 1970. 6 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30 - April 1, 1970.)

Aspects of the measurement and interpretation of prevailing visibility and its use as an air pollution indicator are discussed. When relating prevailing visibility to other air pollution measurements, best results can be expected when the following factors are taken into account: spatial variation in atmospheric concentrations of particulate matter; the effect of high relative humidities; and the origin and age of the aerosol system. Although large short-term variations exist in many areas, averaging data over time (i.e., 1 hour) often improves the correlation with prevailing visibility observations. The visibility measurement is an average of the visual quality over a certain distance and due to the movement of the air the time averaging at one point may correspond to the space averaging. Satisfactory results can be expected only when the relative humidity is below 70% to eliminate reductions in visibility due to water adsorbed on particles. In relating prevailing visibility to mass of particles a well-aged aerosol system is required and this may not occur near large point sources of particles. (Author summary modified)

7891 APTIC NUMBER 21664

O'Keefe, Andrew E.
VARIOUS ASPECTS OF AIR POLLUTION AND ITS MEASUREMENT. Preprint, Boston Univ., Mass., Dept. of Biology, 17p., 1969. (Presented at the Colloquium on Environmental Pollution, Boston, Mass., Nov. 4, 1969.)

Conventional analytical instrumentation as applied to monitoring air pollution is reviewed, and the characteristics of a new family of instruments which evolved to avoid the shortcomings of earlier devices are considered. A flame photometric sulfur detector burns a sample of air in a hydrogen-rich flame and reduces any sulfur compounds for diatomic sulfur; in rising through the flame the S2 is raised to an excited state, then eventually reverts to groundstate S2, releasing light energy in the process. A photomultiplier converts the light signal to an electrical one which is amplified by an electrometer and passed to a recorder. Sulfur compounds can be detected in the parts-per-billion range. Hydrogen sulfide, sulfur dioxide, methyl mercaptan, and other sulfur compounds have been separated and detected at the parts-per-billion level by an improved gas chromatogram. A device has also been developed to measure carbon monoxide, methane, and total hydrocarbons. Liquid chromatography has been developed to detect polynuclear compounds and pesticides, and devices for measuring nitric oxide and ozone in the atmosphere have also been developed. New sensors are needed, capable of responding with electrical signals to chemical stimuli in a quasi specific manner. Examples of possible applications of such transducers and simiconductors in air pollution monitors are given.

7892 APTIC NUMBER 19125

O'Keeffe, Andrew E.
NEEDS IN ELECTRONIC INSTRUMENTATION FOR AIR POLLUTION ANALYSIS. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 15p., 1970 (?). 9 refs.

A new family of air pollution monitoring instruments is described in general terms. Included are devices for the continuous measurement of sulfur dioxide, ozone, nitric oxide, and nitrogen dioxide. One of the devices for monitoring SO2 is the flame photometric detector. An instrument has been developed that provides specific identifications and measurements of individual sulfur-containing compounds, such as hydrogen sulfide, SO2, methyl mercaptan, and the lower members of the mercaptan series of compounds. This instrument, using the flame photometric device as a gas chromatographic detector, can analyze an air sample and report its findings every 5 minutes, with a sensitivity of 1 ppb H2S, SO2, or methyl mercaptan. A highly sensitive and specific procedure for determining ambient levels of ozone is also described. Instruments for detecting NO and NO2 have also been developed. Design concepts are discussed in a search for means by which they may be extended to yield future instruments that will constitute even greater advances. Transducers are needed that will respond directly to environmental compositional changes reversibly and in a quasispecific manner. Several examples are given to illustrate ways in which such devices could be applied to air pollution monitoring. (Author abstract modified)

7893 APTIC NUMBER 19130

O'Neal, John D., F. Lee Rodkey, and Harold A. Collison
ANALYSIS OF METHANE AND CARBON MONOXIDE IN RESPIRATORY GASES BY GAS CHROMATOGRAPHY. Naval Medical Research Inst., Bethesda, Md., Proj. MR005.01.0103B, RP-23, 10p., Nov. 1969. 8 refs.
CFSTI, DDC: AD 701356

A method for analyzing ambient inspired air and of respiratory gas samples for carbon monoxide and methane is described. The gas chromatographic procedure involves separating methane and carbon monoxide from each other and from other gases by use of a 5 A molecular sieve column. The effluent from the column is mixed with hydrogen, passed over a hot nickel catalyst, and then enters the flame ionization detector (FID). Methane in the original sample is detected unchanged at the FID while carbon monoxide of the original sample is converted to methane in the catalyst bed and determined at the FID as methane. Volumes of respiratory gas samples from 2 to 10 ml may be used, depending upon the actual methane and carbon monoxide contents.

7894 APTIC NUMBER 19031

Oeseburg, F.
A LITERATURE STUDY ABOUT THE POSSIBLE USE OF A LASER AS A LIGHT SOURCE IN A PARTICLE COUNTER. Rijksverdedigingsorganisatie TNO, Rijswijk (Netherlands), Chemisch Lab., Br., 1970. 6 refs.
CFSTI: N70-16141

Sensitivity, resolving power, and concentration range are compared for a Royco particle counter and a Jacobi laser counter. The smallest particles that can be detected with both are about 0.3 micron. Factors which determine the resolving power are slope of the response curve, which is the relation between the signal caused by a particle and the particle radius, and the equivalence of the lightwaves of particles entering at different places of the sensing volume. The resolving power of the laser apparatus is much better than that of the Royco, except for the 0.8-1.30 micron range which can be improved by employing the 'two color' system. If a coincidence factor of 5% is accepted, the maximum concentration will be 5.10+4p/l for the Royco and 2.10+6p/l for the Jacobi, while the minimum concentrations are 5.5p/l and 400p/l, respectively.

7895 APTIC NUMBER 17628

Ohira, Toshi, Minoru Takeda, Tatsukichi Ishiguro, and Osasu Koyama
OFFENSIVE ODORS. 7. GAS CHROMATOGRAPHIC ANALYSIS OF OFFENSIVE ODOR AT PLANTS HANDLING FISH ENTRAILS AND BONES. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 4p.

The offensive odors emitted by chemical plants treating fish entrails and bones were analyzed by gas chromatography. The solid reaction tube concentration - gas chromatographic analysis method for ammonia and amines was used. To concentrate the samples, a glass tube packed with glass beads coated with oxalic acid was used, and air was drawn into it and passed through it to be collected. Satisfactory results were obtained with No. 0-2 glass filters. A pump was used for suction, and the volume of air collected was measured by a wet flowmeter. Each sample was transferred to a decomposition tube, a concentrated solution of potassium hydroxide was added to liberate the ammonia and amines, and these were flushed out with air. The gas was collected in a GC sample tube cooled by liquid oxygen, flushed out with heat, and introduced into the gas chromatograph. Most of the analytical values obtained showed that ammonia, trimethylamines, and pyrrole compounds are dominant, and that the proportion of other amines is low. High molecular compounds in the air decrease, and ammonia, which decomposes last, increases as the process proceeds.

7896 APTIC NUMBER 21779

Oikawa, Kikuo
THE COLLECTION AND ANALYSIS OF INORGANIC PARTICULATE MATTER. (Fuyu funjin seibun no sokutei ni tsuite). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 8(1):13-21, April 1, 1970. 6 refs.

High-Volume and Low-Volume Air Samplers are used for measuring and analyzing matter. The former is applied to the measurement of air pollution, while the latter is suitable for short sampling periods or periods from 15 to 30 days and for continual collection. Glass fiber filters used for the Hi-Vol sampler have lower ventilation resistance than membrane filters, but contain metals, such as silica aluminum and zinc, that make quantitative analysis of metals impossible. Lately a polystyrene filter has been developed for Hi-Vol sampler; it contains little inorganic matter and will quantitatively analyze components that the glass fiber filter cannot analyze. It is useful for quantitative analysis of inorganic matter. Samples collected by a glass fiber filter are treated by high or low-temperature burning or wet decomposition. Methods for the analysis of metallic matter utilize its radiation spectrum, optical absorption, fluorescence, radioactivity, polarography, and colorimetric analysis.

7897 APTIC NUMBER 21806

Okita, T., R. Suqaoi, and K. Kaneda
MEASUREMENT METHOD OF ATMOSPHERE HYDROGEN FLUORIDE BY FILTER PAPER IMPREGNATED WITH ALKALI. (Alkali ioshihch ni yo oo taiki chu hookkasooiso no sokooteihoh). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):111, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th 1969.)

Atmospheric hydrogen fluoride (HF) determination with sampling by alkalized filter paper was examined. Alkalized filter papers are prepared by soaking filter papers of about 5 cm in diameter in 10.5 and 1% of Na2CO3 and K2CO3 solution and drying them in a dryer for 2 hours. Their collection efficiencies are obtained using a setup, which consists of an HF generator (HF permeation tube and diluted hydrofluoric acid), thermometers, two pieces of filters prepared in the above manner, a flowrator, and a pump, in this order. Concentrations of HF are varied from 0.005 to 1.00 ppm with a flow rate of 5, 10, 15, and 20 l/min. These filter papers undergo extraction by water to produce sample solutions, to which are added 10% Alfusson and acetone; their light absorption rates are measured. The collection efficiencies of filter papers do not show significant differences between done impregnated with Na2CO3 and one with K2CO3, within the concentration ranges of HF tested, and also with the flowrates used. However, alkali of higher concentration tends to decrease the light absorption rate. HF of more than 0.005 ppm can be determined by this method with the following conditions: 1% Na2CO3 or K2CO3 for alkali, 20 l/min for flowrate, and 120 minutes for sampling time. This method shortens the sampling time required by the impinger method by one-tenth.

7898 APTIC NUMBER 17627

Okita, Toshiichi, Masao Mishima, and Fumimichi Shigeta
OFFENSIVE ODORS. 6. COLLECTION AND ANALYSIS OF OFFENSIVE ODOR BY GAS CHROMATOGRAPHY (THIRD REPORT). COLLECTION AND ANALYSIS OF AMINES. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 4p.

A method of collecting and analyzing amines is discussed. The amines used in the tests were m, d, t-methylamines, which are the most difficult to collect and separate. The results of examination of the various types of packing materials showed that Chromosorb W (60-80 mesh) is the most suitable with TEP (diglycerol 15%, tetraethylenepentamine 5%, and potassium hydroxide 2%) applied to it. The column was 3 m long, with a temperature of 80 C. A Hitachi Model KGL-2 Gas Chromatograph was used, and the measurement was made with a hydrogen-flame detector. An aqueous solution of methylamine was diluted with water, and after neutralization titration, measurements were made. The retention time and minimum quantity detected for each of the methylamines are shown in tabular form. A collection of 99% was obtained when trimethylamine was collected with a glass fiber filter dipped in a 20% aqueous solution of sulfuric acid and then dried. Satisfactory results were also obtained when glass beads were used as packing.

7899 APTIC NUMBER 21859

Okita, T., H. Sugai, and I. Kifune
SAMPLING AND ANALYSIS BY FILTER METHOD OF MALODOROUS GASES IN THE ATMOSPHERE. (Akooshu no sokootei V Loshishiki sampler ni yoloo yuki ioh kagohbootsoo no hoshu hoonsekihon no kentoh narabini ryukasooiso oyobi aldehyde rooi sokootei eno ohyoh). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):118, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

To determine malodors in the environment, filter type sampler for sampling organic sulfur compounds using mercury compounds was earlier introduced. Since then, the following items on sampling and analysis, by means of gas chromatography, of ethyl mercaptan, methyl mercaptan, and dimethyl sulfide were examined. In the process of the analysis (sampling, separation, and concentration), moisture should be removed before concentrating the sample with potassium carbonate and soda lime. The velocity in concentrating the sample with liquid oxygen is 0.2 l/min. The retention time of each sample gas can be remarkably reduced if the column temperature is 47 C, the flowrate of a carrier gas (N2) 30 l/min, and the column length 2.25 m. The reproducibility of this method is approximately 6% in terms of variation coefficients. Filters compared (Tohyoh No. 6 filter, AAWP millipore filter, and glass fiber A filter) show the collection efficiency from 44% to 100%, depending on the gases. This method is applied for gases in the water and the air polluted by waste from pulp and petroleum refining industries to show 6.0-7.8 ppb of methyl mercaptan, 2.9-3.7 ppb ethyl mercaptan, and 5.1-7.2 ppb of dimethyl sulfide in river water and 4.0-5.2 ppb of methyl mercaptan and 2.3-3 ppb dimethyl sulfide in the air.

7900 APTIC NUMBER 19507

Okuda, H.
SMOKE INDICATORS OF RINGELMAN TYPE BY RANGE FINDER. (Sokkyokei tsooki Ringelman shiki baien nohdo sokooteiki ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):81, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A simple Ringelmann type smoke density meter has already been recorded; however, a better model is now presented with a simple distance measuring device. The meter improves the following weak points of its predecessor: large measurement error; difficulties in taking accurate distance from the object required by the standard; different measurement values obtained in the case of stacks with different diameters, even with the same discharge; insufficient smoke density classification; and considerable errors by individuals. In addition, it would enable the measurement of the stack height if a pole of known length is prepared.

7901 APTIC NUMBER 19500

Onichi, S., S. Ito, and M. Suzuki
STUDIES ON HYGIENIC CHEMISTRY OF AIR POLLUTION (I). MEASUREMENT OF FLUORIDE IN THE AMBIENT AIR. (Taikiosen kooshitsoo no eiseikagakoo ni kansooloo kenkyu (1) Taiki chu no fookkabootsoo no sokootei ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):112, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

To give a basis for measuring fluorides in air, which may be discharged from aluminum, fertilizer, glass, and soda industries and influence especially plants, the following experiments were performed, using the lanthanum -ALC method for quantitative analysis. For gaseous fluorides, first the effect of concentrations of dilute sodium hydroxide solution (the absorbent), its absorbing velocity, and absorbed amount on the collection efficiency were examined. Secondly, to know the extent of the interference by other ions coexisting in samples, separation by distillation with several kinds of reagents, like phosphoric acid-perchloric acid, silica-perchloric acid or sulphuric acid-silver sulphate, was tested. The temperature determined the amount of separated fluorides and the removable interfering ions. The sampling of particle fluorides usually involves filters, some of which, include fluorides in a considerable amount, which require to be eliminated before quantitative analysis.

7902 APTIC NUMBER 19089

Paradis, Truchon, and Turpin
STUDY OF THE GRANULOMETRY OF A VOLATILE AEROSOL BY A PHOTOELECTRIC METHOD. Etude de la granulometrie d'un aerosol volatil par une methode photoelectrique). Text in French. Informations Aerauliques Thermiques (Paris), 6(21):8-14, 1969.

A device for measuring the number, distribution, and size of dust particles in an aerosol is described, which operates on the basis of the laws governing the diffusion of light. The device is studied by measuring particles 0.7 micron in diameter and larger and a practical application is made to the study of output of an air conditioner. Several improvements were made, including an automatic recording of readings, which were made visible on a scale or stored in the memory of a multichannel selector, and adaptation of the counting capacity to higher concentrations. This permitted

electronic instantaneous measurements (in 30 seconds) which were applicable to devices that produce or select liquid aerosols.

7903 APTIC NUMBER 19833

Parker, J.
AUTOMATIC SURVEILLANCE OF AIR POLLUTANTS BY THE WARREN SPRING LABORATORY. (Automatische Ueberwachung der Luftverunreinigungen durch das Warren Spring Laboratory). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:383-396, 1970. 2 refs.

A description is given of various aspects of data processing and automatic monitoring techniques in use at the Warren Spring Laboratory, England. The development of a field method for recording data is given, followed by the description of a simple meteorological switching mechanism for measuring emissions at predetermined wind directions and velocities. An automatic laboratory, especially designed for use in measuring high levels of pollution, records data on tape until emissions reach a predetermined level. Also described is a high speed transducer that studies the dispersion of foreign substances in the atmosphere. The equipment remains inactivated until the wind blows in a predetermined direction, at which time an electric signal is triggered automatically; after checking the operating efficiency of all sensors, the control center sets the measuring devices in motion by remote control. Measuring instruments include the following: wind direction with a low-torque potentiometer operated on 5 volts DC; wind velocity by a DC tachogenerator; sulfur dioxide concentrations (continuous monitoring) with a device that measures electrical conductivity; CO concentrations with an infrared instrument; air turbulence with a low-torque potentiometer that can magnetically record as many as 5 readings per second; and an anemometer which records instantaneous wind velocities at the rate of 50 impulses per revolution. A description is given of the use of such equipment in monitoring the atmosphere 5 km east of the city of Scunthorpe, Lincolnshire, at the request of the county health inspector. Another group of instruments has been installed along the coast of the Shire of Norfolk, for the detection of possible pollutants that might be crossing the North Sea from Holland, Denmark, and Germany.

7904 APTIC NUMBER 19225

Pfetsch Ute and Karl Poetzl
STUDY OF THE DETERMINATION OF THE CARCINOGENIC 3,4-BENZPYRENE BY A SIMPLE METHOD OF THIN LAYER CHROMATOGRAPHY. (Beitrag zur Bestimmung des Kanzerogenen 3,4-Benzpyrens durch eine einfache, duennschichtchromatographische Methode). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 20(3):78-81, 1970. 10 refs.

A simplified method for determining the carcinogen 3,4-benzpyrene in aerosols is described, characterized by extraction of the aerosol sample from the filter with small amounts (20 ml) of solvent on a cooling finger. The 3,4-benzpyrene is isolated by thin layer chromatography (three runs in cyclohexan pyridine) on 0.25 mm silical gel G-layers. The benzpyrene is scraped off and mixed with acetone whereby the silica gel is brought to sedimentation. The concentration of the benzpyrene in the obtained solution is determined by fluorimetry.

7905 APTIC NUMBER 19227

Pilz, W. and Ilse Johann
SPECIAL ANALYTICAL METHODS FOR OCCUPATIONAL MEDICINE AND INDUSTRIAL HYGIENE. IV. THE DETERMINATION OF MICROGRAM AMOUNTS OF HEXAMETHYLENEDIISOCYANATE (DESMODUR H) IN AIR AS WELL AS AQUEOUS HEXAMETHYLENEDIAMINE SOLUTIONS IN THE 0.01 PPM AREA. Spezielle analytische Methoden fuer die Arbeitsmedizin und Industriehygiene. IV. (Die Bestimmung von Mikrogrammengen Hexamethylendiisocyanat (Desmodur H) in Luft sowie waessrigen Hexamethylendiaminloesungen im 0.01 ppm Bereich). Text in German. Mikrochim. Acta, 27(2):351-358, April 1970. 12 refs.

A recently published method for determining small amounts of hexamethylenediisocyanate in the air was refined so that it can now be used for determining concentrations in the 0.01 ppm range. The principle of the method is based on absorption of hexamethylene diisocyanate from air wherein a saponification to hexamethylenediamine occurs. The amine is converted with 1-fluorine-2,4-dinitrobenzene in a solution which has been buffered with sodium hydrogen carbonate. The reaction product is extracted with 1,1,2,2-tetrachloroethane and photometrically determined. The main error of the method is caused by the water which has to be used in the reaction vessels because of the overflow of the isocynate solution and the absorber. According to the improved method, up to 100 ml water can be added without impairing the accuracy of the method. As little as 200 micrograms hexamethyldiisocyanate could be determined.

7906 APTIC NUMBER 19085

Poudrai, M.
METHOD OF TAKING SAMPLES FROM A DUST-LADEN STREAM OF GAS. (Methode de prelevement dans une veine gazeuse empoussieree). Text in French. Informations Aerauliques Thermiques (Paris), 6(21):15-28, 1969. 7 refs.

The theoretical aspect of dust sampling under isokinetic conditions is discussed, and the application is made to the principal types of probes used. The following standards must be adhered to when constructing an apparatus for the measurement of dust content: it must be totally air-tight; capable of total retention of the dust aspirated by the separating system; designed to withstand changes in temperature; resistant to corrosive agents; insulated against electrostatic charges; and it must be lightweight, easily handled, secured, and cleaned.

7907 APTIC NUMBER 19702

Prabhakara, C., B. J. Conrath, M. A. Hanel, and E. J. Williamson
REMOTE SENSING OF ATMOSPHERIC OZONE USING THE 9.6 MICRON BAND. J. Atmospheric Sci., 27(4):689-697, July 1970. 20 refs.

Spectral measurements made by a high resolution infrared interferometer spectrometer aboard the Nimbus III satellite are used to deduce, remotely, atmospheric ozone content and distribution. This indirect method depends on the emission and absorption properties of ozone in the 9.6 micron region, as well as some gross climatological properties of the vertical ozone profile. Several IRIS spectra were analyzed and the corresponding vertical ozone distributions determined. A comparison of ozone soundings made by chemical sounders with those derived from satellite data shows relatively good agreement of gross features. The total ozone estimated from the derived profiles compares well with the measured total. This study shows that atmospheric ozone total content can be determined, with the help of IRIS spectra, over a large part of the globe with an accuracy of plus or minus 6 compared to values derived from Dobson measurements. (Author abstract modified)

7908 APTIC NUMBER 21731

Preining, Othmar, Ruth Baumann, and Franz Moser
RESULTS OF SO2-MEASUREMENTS WITH THE 'ULTRAGAS 3' AND BY THE WEST-GAEKE METHOD, CARRIED OUT BY MEANS OF A CALIBRATION GAUGE. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(11):1-5, Nov. 1969. 5 refs.

Recording instruments used for monitoring air pollution also require, in addition to mechanical servicing, a quantitative checking of the measuring values indicated. The West-Gaeke measuring arrangement, which enables the calibration and the control of the 'Ultragas 3' devices, is based on the reaction taking place between sulfur dioxide and sodium tetrachloromercurate in an intensive wash bottle, which after the addition of p-rosalinin and formaldehyde forms a lacquer enamel that can be quantitatively determined by means of a photometer. The photometer reading is a measure for the amount of converted SO2 and gives the concentration when the total air quantity is known. Since the approximate concentration was already given by the reading of the 'Ultragas 3' device, it was possible by means of a suitable choice of the quantity obtained from the wash bottle to achieve at all times such a color intensity that the photometer read-out accuracy was about the same from one test to another. The continuously operating measuring devices are based on the conductivity principle. A portable type of this calibration gauge makes possible the checking of instruments used at outdoor measuring points.

7909 APTIC NUMBER 19698

Ramana Murty, T. V. and M. Malinimohan Rao
EFFECT OF OZONE CONTENT ON THE PRE-SUNRISE FALL IN AMPLITUDE OF LF RADIO WAVES. J. Atmospheric Terrest. Phys., vol. 32: 1319-1328, 1970. 9 refs.

The first pre-sunrise fall in amplitude of radio waves of frequency 164 kHz transmitted from Radio Tashkent and received at Delhi at a distance of 1600 km is found to usually occur when the solar zenith angle at the path midpoint is near 98 deg. This value of the solar zenith angle has a small seasonal variation that is directly correlated with ozone content. Thus, ultraviolet light appears to be responsible for the release of electrons during the pre-sunrise period. The fall in amplitude from its commencement up to the first minimum is not always smooth but is accompanied in about 40% of the cases by a sudden change in the gradient occurring most nearly when the solar zenith angle is equal to 95 deg. This may indicate the existence of more than one species of negative ions. (Author abstract modified)

7910 APTIC NUMBER 19185

Raynor, Gilbert S. and Eugene C. Ogden
THE SWING-SHIELD: AN IMPROVED SHIELDING DEVICE FOR THE INTERMITTENT ROTOSLIDE SAMPLER. J. Allergy, 45(6):329-332, June 1970. 4 refs.

A swing-shield is described that protects the sampling surface of intermittent rotoslide samplers, which sample pollens and similar sized particles from the atmosphere, against wind impaction more effectively than a cylindrical or fly shield. The shield is designed so that no part extends further from the center of rotation than the slide holders. Shielding plates remain parallel to the slide holders during operation, thus minimizing air resistance and requiring less power for adequate speed than alternative designs which expose a greater surface area to the wind. Rotoslides using this shield are particularly well adapted for sequential sampling if used with an appropriate timing device. A rotoslide sampler equipped with the swing shield and two earlier models were tested for wind impaction efficiency in a wind tunnel, as well as for their abilities to protect sampling surfaces from wind during operation and when not operating. Shielding effectiveness and simplicity of operation were demonstrated for the swing-shield.

7911 APTIC NUMBER 21823

Raynor, Gilbert S. and Eugene C. Ogden
THE SWING SHIELD: AN IMPROVED SHIELDING DEVICE FOR THE INTERMITTENT ROTOSLIDE SAMPLER. Preprint, New York State Museum and Science Service, Albany and Brookhaven National Lab., Upton, N. Y., 5p., 1969 (?). 4 refs.

An intermittent rotoslide sampler shielding device which operates by centrifugal force is described. The swing-shield is a more reliable and less expensive device than previous ones. Rotational speed with this device is about 80 rpm less than the original type, but wind tunnel tests show that sampling efficiency is approximately the same. Rotoslides using this shield are particularly well-adapted for sequential sampling if mounted together with an appropriate timing device.

7912 APTIC NUMBER 21927

Raynor, Gilbert S.
VARIATION IN ENTRANCE EFFICIENCY OF A FILTER SAMPLER WITH AIR SPEED, FLOW RATE, ANGLE AND PARTICLE SIZE. Am. Ind. Hyg. Assoc. J., 31(3):294-304, May-June 1970. 14 refs.

The effect on the entrance efficiency of a filter holder caused by variations in the following parameters--air speed, flow rate, angle between the air flow and the filter holder, and particle size--was studied in a wind tunnel. Efficiencies for particles 0.68, 6, and 20 micron in diameter were determined at wind speeds of 100, 200, 400, and 700 cm/sec and filter flow rates of 6.4, 12.7, and 25.4 liters/min over a range of angles from 60 to 120 deg from the horizontal. The entrance efficiency varied with all parameters from less than 1% at the highest wind speed and lowest flow rate to 100% at forward angles where impaction aided suction. Efficiency was generally lowest with the filter holder entrance at right angles to the airstream, increased as the entrance was tilted forward toward the wind, and also increased, but more slowly, as it was tilted backward away from the wind. An empirical equation was developed to model the pertinent parameters; it gave values in reasonable agreement with those found experimentally. (Author abstract)

7913 APTIC NUMBER 21836

Raynor, Gilbert S.
WIND IMPACTION EFFICIENCY OF NON-OPERATING ROTOSLIDE SAMPLERS. Preprint, Brookhaven National Lab., Upton, N. Y., 5p., 1969 (?). 6 refs.

The wind impaction efficiency of three non-operating rotoslide samplers, one unshielded and the others shielded by different methods, was measured in a wind tunnel at wind speeds of one to eight meters per second and at four directions relative to the wind. The efficiency of an unshielded slide edge facing the wind varied from 58 to 98%. Its efficiency when facing other directions and the efficiencies of all shielded slides were low, demonstrating the necessity of shielding and the effectiveness of the shielding devices tested. Data presented pertain to ragweed pollen. (Author abstract)

7914 APTIC NUMBER 21747

Rissmann, F. F. and R. L. Larkin
AN INFRARED METHOD FOR RAPID ANALYSIS OF THE SULFATE CONTENT OF REACTED LIME AND LIMESTONE MATERIALS. Preprint, General Technologies Corp., Reston, Va. and Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 15p., 1970 (?). 13 refs.

A thin film cell technique was developed for the rapid analysis of the sulfate content of calcined limestones which have been reacted with sulfur dioxide in a flue gas. Accurate analysis can be conducted by dissolving the limestone material in tetrasodium EDTA (ethylenediaminetetraacetic acid) saturated aqueous solutions. Spectra are obtained in a 0.003 mm infrared liquid cell. For the infrared determinations, an identical cell, containing a saturated EDTA solution, is placed in the reference beam of the spectrometer. The results are in good agreement with determinations made independently by different techniques. Similar analysis can also be conducted for the carbonate, silicate, and hydroxide contents of limestone with the use of EDTA saturated D2O as the solvent. (Author abstract modified)

7915 APTIC NUMBER 19438

Rodes, Charles E., Jack A. Bowen, and Franz J. Burmann
A PORTABLE CALIBRATION APPARATUS FOR CONTINUOUS SULFUR DIOXIDE ANALYZERS. Preprint, Air Pollution Control Association, New York City, 45p., 1970. 2 refs. (Distributed at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-17, 1970.)

Procedures were prepared to facilitate the calibration of continuous sulfur dioxide analyzers in field locations. These procedures describe in a step-by-step format the construction and operation of a Portable Calibration Apparatus (PCA). The apparatus is an application of gravimetrically calibrated permeation tubes. The availability of standard permeation tubes will be a limiting factor in not only the pollutants and ranges available, but also the accuracy of the pollutant concentrations generated. The apparatus was designed specifically for portability and does not include a thermostatically controlled water bath to permit unattended operation. The general specifications for the apparatus are given and a schematic diagram of the system is provided. These specifications apply only if the parts and materials listed are used. (Author abstract modified)

7916 APTIC NUMBER 21843

Rodkey, F. Lee
CARBON MONOXIDE ESTIMATION IN GASES AND BLOOD BY GAS CHROMATOGRAPHY. Preprint, New York Academy of Sciences, New York, 18p., 1970. 19 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

A method for measuring carbon monoxide levels in respiratory gases and blood with a gas chromatograph is presented. The method utilizes chromatographic separation together with flame ionization detection. Measurement of sample volume and the estimation of CO chromatogram area are the two factors which determine the accuracy of the procedure. An in-line catalyst quantitatively converts CO to methane for measurement purposes. A description of the equipment and process and sample chromatograms are included.

7917 APTIC NUMBER 19557

Rosen, J. M.
METEORIC DUST DETECTION BY LIGHT SCATTERING TECHNIQUES. Minnesota Univ., Minneapolis, School of Physics and Astronomy, Contract N00014-67-A-0113-0004, Rept. AP-30, 19p., Oct. 1969. 8 refs. CFSTI, DDC: AD 697684

A detection technique and laboratory prototype are described for

measuring vertical distribution and the concentration of large dust particles (diameter between 2 and 30 microns) in the upper stratosphere, especially after a meteor shower. The instrument consists of a balloon-borne photoelectric particle counter; during ascent or descent, air would pass through the vertical tube and consequently through the beam of light. By means of a lens system and a field aperture, the photomultipliers will detect illuminated dust particles passing through only the center 25 sq cm of the vertical tube. Two photomultipliers would be used in a coincident counting system to make the system highly reliable and insensitive to extraneous noise. Expected advantages of the system are noted, and laboratory test results are reported indicating its feasibility.

7918 APTIC NUMBER 12314

Rotheram, M. A.
LABORATORY CONTAMINANT SENSOR. (FINAL REPORT). Perkin-Elmer Corp., Pomona, Calif., Aerospace Systems, Contract NAS 1-7266, CR-66606, 103p., March 1968.
CFSTI: N68-23461

The theory, development, and testing of a sensor instrument for detection of contaminants in spaceship atmospheres is described. The instrument design is based on the use of an accumulator cell which contains a sorbent for extraction of contaminants from air at room temperature. On heating the cell, contaminants are desorbed through a special inlet system to a mass spectrometer for identification and determination. The performance of the instrument was evaluated by tests with a variety of typical contaminants, including such compounds as acetaldehyde, benzene, butene-1, carbon disulfide, carbon monoxide, formaldehyde, hydrogen chloride and sulfide, methane, nitric oxide, nitrous oxide, sulfur dioxide and toluene. Three sorbents - Porapak Q, charcoal, and Molecular Sieve 5A - were used to sorb the various contaminants. A palladium-coated charcoal sorbent was prepared and successfully tested for the detection of carbon monoxide. Lower detectable limits for contaminants range from 0.5 to 5 ppm with the analytical conditions used. These conditions can be changed to permit detection of smaller concentrations. Identifications of contaminants is facilitated by the use of three sorbents and programmed temperature desorption. A characteristic desorption temperature is determined for each contaminant. Correlation between boiling point and this desorption temperature, in addition to the mass spectra deduced from the desorption curves, provide information for identification of unknown contaminants. The test results demonstrate that this instrument concept has considerable potential for detection, identification, and quantitative determination of atmospheric contaminants. (Author abstract modified)

7919 APTIC NUMBER 17638

Sakuma, Kenzo, Taku Miura, Toru Domon, Koshiro Kanazawa, Shinichi Narisa, and Taichiro Wasiki
OFFENSIVE ODORS. 17. MEASUREMENT OF ODOR BY SENSORY PERCEPTION WITH THE USE OF AN ODOR-FREE ROOM. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 6p.

The threshold values for hydrogen sulfide and trimethylamine were studied. The odor-free room, used for the test, was cubic in shape, covered with stainless steel, and of an interior volume of 7.5 cu m. The room had a water-wash device and, in an upper part, a ventilation fan to change the air. Also, a small fan for agitation was attached to ensure adequate diffusion of the sample. The sample was either injected through a window or introduced by some other method. The single substances used in the tests were H2S filled in a bomb, and a 30% aqueous solution of trimethylamine. The latter was used in 1%, 0.1%, and 0.01% alcoholic solutions. The panel for the odor measurement consisted of six investigators. The necessary amount of H2S was taken by a syringe and injected through the window for the sensory test. The trimethylamine was placed in a watch glass and volatilized in the middle of the room. After agitation of the air in the room for one minute, the panelists entered. The threshold value for H2S was 0.005 ppm; the environmental offensive odor was 20 ppm; and the public hazard offensive odor level was 150 ppm. For trimethylamine, 0.0003 ppm was the threshold value; 0.002 ppm the environmental offensive odor; and 3 ppm the public hazard offensive odor level.

7920 APTIC NUMBER 21834

Saltzman, Bernard E.
FACTORS IN AIR MONITORING NETWORK DESIGN. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 8p., 1970. 6 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

Theoretical studies performed to increase the value and significance of air quality monitoring network data are discussed. Some of the statistical aspects of sampling are reviewed and a figure is presented which facilitates the design of sampling programs with a minimum of analytical effort. Also considered are strategies for station location and operation and the effect of sampling time. Brief mention is made of similar studies in progress to determine responses of monitoring instruments to fluctuating concentrations.

7921 APTIC NUMBER 20176

Sarkisov, S. L., G. V. Stepanov, and S. V. Shvedov
PRECIPITATION OF SOLID AEROSOLS IN IMPACTOR TRAPS. (O kharaktere osazhdeniya tverdykh aerozoley v impaktornykh lovushkakh). Text in Russian. Tr. Nalchik. Vysoko. Geofiz. Inst., No. 8:9-12, 1968. 10 refs.

An impactor was designed for a direct light-microscope study of aerosol precipitation. Spattering of water droplets and hence loss of aerosol particles was determined as a function of temperature (16-34 C) and humidity (35-80%). The importance of moisture condensation and subsequent evaporation to the trapping of fine particles is stressed. The use of such impactor traps for collecting samples suitable for electron-microscope

study of aerosol concentration and spectrum is considered feasible.

7922 APTIC NUMBER 21811

Sato, J. and S. Sakuraba
THE MEASUREMENT OF PLUME RISE BY LIDAR. (Lider ni yoloo keisooli no johshohkoh no sokootei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):96, 1969. 2 refs. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The measurement of plume rise by lidar is compared with one by theodolite. A lidar for distance measurement is modified so as to (a) show horizontal and vertical angles, (b) show echo strength on a scope using techtronics-synchroscope, and (c) take a photo at the echo strength shown on A scope through a Polaroid camera. The direction of the plume, its height, and its distributions in horizontal and vertical directions are measured by the lidar and a theodolite placed about 1.5 km from a stack (130 m effective height, 1.32 by 10 to the 6th power cal/sec heat emission) and the other (120 m, 9.59 by 10 to the 6th power 10 cal/sec). The results from both methods show no significant difference and agree with theoretical formulations.

7923 APTIC NUMBER 19934

Saylor, Charles Proffer
CONTINUOUS GAS-LIQUID CHROMATOGRAPHY METHOD UTILIZING ANNULAR OPEN COLUMNS. (U. S. Secretary of Commerce) U. S. Pat. 3,511,028. 3p., May 12, 1970. 1 ref. (Appl. Jan. 15, 1969, 8 claims).

A continuous gas-liquid chromatography method utilizing annular open (unpacked) columns is described. A carrier gas flows through a column, at least one wall of which is coated with a separation liquid and rotated about its axis, while constraining the gas to flow substantially parallel to the axis of the column. The gaseous mixture to be separated is introduced at a fixed point, and the components of the mixture are withdrawn at angularly spaced fixed points. The column walls may be coated with different separation liquids to separate three or more components which are difficult to separate with any single separation liquid. This method provides a high speed, high resolution operation at low carrier gas pressures, thereby greatly improving upon prior methods.

7924 APTIC NUMBER 19176

Scaringelli, Frank P., Andrew E. O'Keeffe, Ethan Rosenberg, and John P. Bell
PREPARATION OF KNOWN CONCENTRATIONS OF GASES AND VAPORS WITH PERMEATION DEVICES CALIBRATED GRAVIMETRICALLY. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 24p., 1969. 9 refs.

Detailed directions are given for the preparation, gravimetric calibration, and method of use of permeation devices to prepare low concentrations (ppm to ppb) of gases and vapors in air, for application to air pollution and other studies requiring gaseous standards. Permeation tubes consist of fluorinated ethylene-propylene copolymer (FEP Teflon) tubing, containing a liquefied gaseous substance hermetically sealed under its own pressure. These tubes are plugged with a section of Teflon rod, charged with liquefiable gas, and sealed. The process depends primarily on the dissolution of gas in Teflon, diffusion through the Teflon wall, and evaporation from the outer surface. Temperature must be controlled to within 0.1 C, while the main driving force is the difference in partial pressure between the inner and outer walls of the tube. Increasing the temperature or tube length increases the concentration of the pollutant. With a permeation rate of one microgram/min or higher, accuracy is greater than 99%. Calibration errors can be minimized by plotting gross weight of the tube against time. Regression analyses afford the best treatment of the data to calculate the mean rate and the degree of confidence expected. Typical calibration curves are given for sulfur dioxide, ammonia, nitrogen dioxide, and butane, and special precautions are given for handling the more reactive gases. The major disadvantage of this method is the period of time, often several weeks, required to establish a mean permeation rate.

7925 APTIC NUMBER 21901

Scaringelli, F. P., E. Rosenberg, and K. A. Rehme
STOICHIOMETRIC COMPARISON OF PERMEATION TUBES AND NITRITE ION AS STANDARDS FOR THE COLORIMETRIC DETERMINATION OF NITROGEN DIOXIDE. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington D. C., National Air Pollution Control Administration, 30p., 1970. 15 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

The most commonly used procedure for the determination of the oxides of nitrogen in air is the colorimetric method of Saltzman. The ratio of dye produced from nitrogen dioxide to that produced from nitrite ion has been the subject of considerable controversy. Saltzman's original analyses showed that 1 mole of nitrogen dioxide was equivalent to 0.72 mole of nitrite ion. Subsequent investigators have reported values of the stoichiometric factor ranging from 0.5 to 1.0. It was also maintained that the stoichiometric factor varied with concentration and approached 1 at levels of NO2 comparable to those found in the atmosphere. A two year study involving hundreds of analyses has established stoichiometrically that 1 mole of nitrogen dioxide is equivalent to 0.764 plus or minus 0.005 mole of nitrite ion. Also, the sources of experimental error discovered and the corrective compensations necessary are reported. Precautions relating to the use of permeation tubes in preparing standard concentrations of NO2 are enumerated.

7926 APTIC NUMBER 19458

Schieger, N. J., T. M. Allen, S. B. Gerber, G. E. Kinsella, F. J. Krupka, and D. W. Reilly
IMPROVED MEMBRANE-FILTER AIR-SAMPLING METHODS FOR ENVIRONMENTAL CONTROL. Health Phys., vol. 7:185-190, 1962. 7 refs.

Air sampling is a useful tool for controlling, as well as for analyzing, the environment. The equipment and techniques described were designed to facilitate the collection of localized samples directly at the source of potential contamination. Routine use of membrane filters was simplified by the design of a small, inexpensive filter holder, providing advantages over commercially available units, such as reduced size and weight, tight sealing against any filter material without the twist-lock action which often damages filter membranes, and parts exposed to contamination are expendable. Techniques for determining sample collection rates directly from vacuum-gauge readings are described. A combination alpha-gamma scintillation detector assembly, designed specifically for counting membrane-filter samples, was constructed. Sample preparation techniques for use with internal proportional counters are also mentioned. (Author abstract)

7927 APTIC NUMBER 19711

Schikarski, Wolfgang and Hans Wild
THE RELATIONSHIP OF THE DECREASE OF CONCENTRATION OF NUCLEAR AEROSOLS WITH AEROSOL PROCESSES. (Zum zusammenhang der Konzentrationsabnahme von nuklearen Aerosolen mit Aerosolprozessen). Text in German. Staub, Reinhaltung Luft, 30(6):251-255, June 1970. 11 refs.

A mathematical model was developed which describes the transport in space and the behavior in time of nuclear aerosols and which is used to determine emissions released by nuclear power plants. The aerosol concentration and its functional dependence on aerosol processes such as coagulation, sedimentation, diffusion, and convection are of primary importance in this context. The test set up and the measuring technique are described for generation of aerosols and for determination of their radiation in space and time. The tests were made with UO2 aerosols produced by the exploding-wire technique in two containers with volumes of 2.2 cu m and 0.02 cu m respectively. Their concentrations were monitored by a laser-aerosol spectrometer for many days. In addition, experiments at elevated gas temperatures (up to 140 C) were carried out. First attempts at a quantitative interpretation of the decrease of concentration with the aid of mathematical representations of the several reconfiguration processes that aerosols can undergo are discussed at length.

7928 APTIC NUMBER 19309

Scoggins, M. W.
ULTRAVIOLET SPECTROPHOTOMETRIC DETERMINATION OF SULFUR DIOXIDE. Anal. Chem., 42(9):1091-1093, Aug. 1970. 1 ref.

An ultraviolet spectrophotometric procedure for analyzing sulfur dioxide in complex research samples and plant streams is based on the observation that sulfur dioxide in 1 M sulfuric acid solution has an absorption band at 276 nm. Since both sulfur and bisulfite ions are converted to sulfur dioxide in 1 M sulfuric acid solution, these materials are also determined. A quantity of sample containing not more than 0.08 m mole SO2 to a 50-ml volumetric flask and diluted to 40 ml with water. After 5 ml of 5 M sulfuric acid solution is added to the flask and similarly diluted with water, the absorbence of the solution at 276 nm vs a reagent blank is measured. The SO2 concentration is calculated from a previously prepared calibration. In the 0.01 to 1.0% range, the average SO2 recovery is 98.2%. The data obtained by this technique are in good agreement with those obtained by the standard iodimetric procedure. Analysis of a sodium bisulfite solution yielded values of 0.064 and 0.066 wt % by the ultraviolet and iodimetric procedures, respectively.

7929 APTIC NUMBER 21939

Searl, T. D., F. J. Cassidy, W. H. King, and R. A. Brown
AN ANALYTICAL METHOD FOR POLYNUCLEAR AROMATIC COMPOUNDS IN COKE OVEN EFFLUENTS BY COMBINED USE OF GAS CHROMATOGRAPHY AND ULTRAVIOLET ABSORPTION SPECTROMETRY. Anal. Chem., 42(9): 954-958, Aug. 1970. 10 refs.

A routine method was developed to measure polynuclear aromatic compounds in coke oven effluents. Although other techniques are involved, the primary ones are gas chromatography and ultraviolet absorption spectrometry. In practice, samples are collected on a filter and the filter is extracted with cyclohexane. An internal standard is added and a portion of the extract is injected into a gas chromatograph for separation into fractions that are trapped. UV absorption spectra of selected fractions provide a quantitative measurement of fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(a)pyrene, and benzo(e)pyrene. Benz(c)acridine and benz(a)anthrone are also included in the method but were not observed to be present. It is difficult to establish the absolute accuracy for samples of this nature, since only a small proportion of the material present is reported upon. Taking this into consideration, each step in the method was accepted as satisfactory only after being proved to be quantitative. Good cross checks were obtained by mass spectrometer and fluorescence analysis. (Author abstract modified)

7930 APTIC NUMBER 17640

Shigeta, Yoshihiro, Shigeo Kobayashi, Michio Hayashino, and Yoshimasa Koyama
OFFENSIVE ODORS. 19. SENSORY PERCEPTION MEASUREMENT OF ODOR BY THE AIR DILUTION METHOD. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 7p.

The Olfacto-tester is a device for sensory perception measurements of odor using the air dilution method as its basis. A 300 ml portion of the prepared odor was put into the odor generating device and aerated when flowing at a rate of 3600 ml/min through a glass tube inserted 1 cm deep in the liquid. Measurement was done by the gradation method. The gradation levels were: 0 - odorless, 1 - faint odor, 2 - weak odor, 3 - fairly strong

odor, 4 - strong odor, and 5 - violent odor. The odors of hydrogen sulfide, trimethylamine, isovaleric acid, diallyldisulfide, and ethylmercaptan were selected for study. Tests were also conducted on feces and urine, and lean fish solubles. The average value of level 1 was made the threshold value, and the average value of level 3, the environmental offensive odor level. The concentration of diluted odor of ammonia was measured with the Kitagawa-type detector tube, and was compared with the theoretical dilution concentration at the same multiple. In these experiments, there were differences between the odor dilution multiples of flowmeter and the actual measurement values of ammonia by detection tube. Reasons for this discrepancy are given.

7931 APTIC NUMBER 21839

Shikiya, James, Herbert Faigin, and Donald Daymon
WORKSHOP SESSION ON THE BECKMAN MODEL 77 OXIDANT ANALYZER. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 7p., March 30, 1970. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

California air quality standards define an oxidant as a substance that oxidizes a selected reagent that is not oxidizable by oxygen under ambient conditions. For air pollution purposes, this includes ozone, organic peroxides, and peroxyacyl nitrates, but not nitrogen dioxide. Eye irritation and lung impairment are not thought to be due to ozone but are associated with its presence in the atmosphere. Therefore, the method of measurement of oxidants is the reaction of ozone in a neutral potassium iodide solution, corrected for nitrogen dioxide or any accepted equivalent procedure. The Beckman Model 77 Oxidant Analyzer is based on the reaction of ozone with potassium iodide in a neutral (pH 7) buffered solution. It uses a complex optical system with either an interference wedge or a UV band path filter. Solutions are sent through a single cell or, if the solution's optical properties vary, through two cells. The en ;gy level is detected by a pair of matched light-sensitive photocells. The ratio of the two light energy outputs is detected and sent to the recorder. Since it is the panel meter that is the true indication of oxidants concentration, the chart zero and span must be carefully adjusted to obtain valid recordings. The minimum detectable concentration change is less than one part per hundred million until the high end of the scale is reached. Sulfur dioxide and hydrogen sulfide give a down scale deflection. Nitrogen dioxide gives a positive deflection. Calibration may be performed either statically or dynamically. Cost of the unit is approximately 3500 dollars.

7932 APTIC NUMBER 19502

Shiozawa, K. and A. Ohtaki
STUDY ON METHOD OF MEASURING DUST CONTENT. (Baijin iyo sokootei ni kansoolu kenkyu (Dai 1 poh)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):32, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

Although a weight concentration method is prescribed in the JIS.Z.8808 (1963) for measuring dust concentration, it has many short comings. A factor influencing the measurement error is the dust collection efficiency of dust tubes and filter papers of samples. The collection efficiency is expressed in terms of y as the collection efficiency, the distribution of dust particle diameter, and a probability which a particle with y in diameter is collected. Two models are considered.

7933 APTIC NUMBER 21920

Smith, Billy S. and J. O. Pierce
The USE OF PLASTIC BAGS FOR INDUSTRIAL AIR SAMPLING. Am. Ind. Hyg. Assoc. J., 31(3):383-388, May-June 1970. 13 refs.

A discussion of the application of plastic bags is presented, along with results of an experiment in which two plastic film materials were used to contain the the vapors of four different chemicals at concentrations bracketing the current (1969) threshold level value. The four chemicals--benzene, methyl alcohol, methyl isobutyl ketone, and methylene chloride--are members of classes of important compounds used in many industrial applications. Additional studies using reactive mixtures under various environmental conditions are needed to determine retention characteristics under conditions similar to the conditions under which the samples are collected or standards prepared. (Author abstract)

7934 APTIC NUMBER 19706

Spurny, Kvetoslav and Jiri Piser
REMARKS CONCERNING THE MICROGRAVIMETRIC DETERMINATION OF AEROSOL CONCENTRATIONS WITH THE AID OF FILTRATION METHODS. (Bemerkung zur mikrogravimetrischen Bestimmung der Aerosolkonzentration mit Hilfe von Filtrationsmethoden). Text in German. Staub, Reinhaltung Luft, 30(6):249-250, June 1970. 4 refs.

Discs 1 cm in diameter were punched from three commercially available materials: Whatman's analytic paper filter, Synthesia membrane filter with pores of 0.8 micrometer radius, and a GE nucleopore filter with pores of 0.4 micrometer radius. They were used in a portable air-sample aspiration device for gravimetric determination of aerosol concentrations. Hygroscopicity of the paper and membrane filter materials made it necessary to keep the former in a desiccator for at least 24 hours before use and store the latter at 80 C for 3 days before use. Nucleofilters are completely nonhygroscopic. All filter discs were weighed before and after sampling on an electrical microscale in the laboratory. Results of five weight measurements obtained with each of the three individual filters before and after sampling and the associated relative errors are presented tabularly. They show that the paper filter is suitable for determination of dust amounts above 50 micrograms, the membrane filter - for amounts as low as 10 micrograms, and the nucleopore filter - for amounts of the order of 1 microgram. Hence, gravimetric methods can be used to measure the aerosol and dust concentration in 'clean' room air and forest or mountain air. Results of

activation analysis of the three unexposed filter materials are also presented tabularly. It shows that the membrane and, particularly, the nucleopore filter are well-suited for activation analysis.

7935 APTIC NUMBER 19537

Stein, Felix
PARTICLE SIZE MEASUREMENTS WITH PHASE CONTRAST MICROSCOPY. Powder Technol. (Amsterdam), vol. 2:327-334, 1968/69. 7 refs. (Presented at the Intern. Conf. Powder Technology, Chicago, Ill., 1968.)

Identical samples of particulate materials were sized with phase contrast and with bright-field microscopy and the results were compared. The phase microscopy revealed from approximately 30% to 70% more of the small particles than the bright-field microscope. Photomicrographs of polystyrene latex spheres of known sizes were used to determine the accuracy of size measurements with phase contrast of particle sizes close to the limit of resolution. Only with phase contrast is it possible to size accurately particles as small as the theoretical limit of resolution of the objective. With bright-field microscopy the limit of accurate size measurements is highly dependent on the optical properties of the particles. (Author abstract)

7936 APTIC NUMBER 21904

Stevens, Robert K., Andrew E. O'Keeffe, and Gordon C. Ortman
AN AUTOMATED GAS CHROMATOGRAPHIC PROCEDURE TO MEASURE ATMOSPHERIC CONCENTRATIONS OF CARBON MONOXIDE AND METHANE. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 18p., 1970. 5 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

An automated, semi-continuous gas chromatographic system with a flame ionization detector was developed to measure sub-part-per-million levels of methane and carbon monoxide in polluted air. Special attention was given to the design of a stripper column to prevent water vapor, carbon dioxide, and hydrocarbons other than methane from reaching the main (molecular sieve) column. A catalytic surface quantitatively converts carbon monoxide to methane for measurement with the flame ionization detector. Repetitive gas chromatographic measurements of carbon monoxide and methane in ambient air in a residential area were recorded with this automated system over a three-month period. Concentrations during this period ranged from 1.35 to 4 ppm for methane and 0.3 to 10 ppm for carbon monoxide. (Author abstract)

7937 APTIC NUMBER 21902

Stevens, Robert K.
REVIEW OF ANALYTICAL METHODS FOR THE MEASUREMENT OF SULFUR COMPOUNDS IN THE ATMOSPHERE. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 21p., 1970. 22 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

Some of the methods under consideration by the National Air Pollution Control Administration as standard analytical procedures to measure sulfur compounds in the atmosphere are discussed. These methods include the following: the West-Gaeke colorimetric method to measure SO2, the coulometric method as employed by commercial manufacturers; conductimetric methods as employed by several commercial manufacturers; the STRacton-cadmium hydroxide method for the measurement of H2S; the flame photometric detector for SO2 measurement; and a gas chromatographic system incorporating a flame photometric detector to measure ambient concentrations of SO2, H2S, and CH3SH3. While the modified West-Gaeke method is tentatively being considered as a standard, the method has serious shortcomings and the validity of the measurements is subject to question unless the temperature, pH, and purity of reagents are carefully controlled. The Philips Coulometric sulfur dioxide system is the most trouble-free, drift-free wet chemical method tested. Except for methyl mercaptan, the system appears to respond to few substances potentially present in the atmosphere. The relative simplicity and the minimum amount of support instrumentation required by the STRacton-cadmium hydroxide method make it attractive as an H2S standard. However, it is a batch technique, and real-time monitoring is to be preferred for H2S. Conductivity analyzers have collected most of the SO2 data obtained in the last 10 years; however, conductivity measurements will always be questioned by knowledgeable chemists because of their inherent interference sensitivity. The flame photometric detector response produces a straight line relationship between 5 ppb and about 0.4 ppm on a log-log scale for compounds whose sulfur content exceed 50% by weight. A calibrated FPD obtained good agreement, both qualitatively and quantitatively, with a modified West-Gaeke instrument in recent tests. A recently developed gas chromatographic system using a FPD to measure ambient concentrations of SO2, H2S, and CH3SH will be used to survey the atmosphere in several major urban areas and in areas with kraft mill activities to determine the ratio of SO2 to total atmospheric gaseous sulfur.

7938 APTIC NUMBER 19913

Stigliani, Daniel J., Jr., Raj Mittra, and Richard G. Semonin
PARTICLE-SIZE MEASUREMENT USING FORWARD-SCATTERED HOLOGRAPHY. J. Opt. Soc. Am., 60(8):1059-1067, Aug. 1970. 11 refs.

An experimental and theoretical investigation of the application of forward-scatter Fresnel holography to water droplets is presented. The theoretical holograms are constructed on a digital computer by determining the irradiance of the interference pattern formed by the light scattered from a droplet and a reference source, at discrete points on a hologram. Forward-scattered light is evaluated by assuming that the droplet is an opaque disk and utilizing the Rayleigh-Sommerfeld theory of diffraction. The reconstructed wave front is evaluated by performing the Fresnel transform on the hologram matrix. Corresponding experimental

holograms are made with a helium-neon continuous-wave laser and using glass beads from 80 to 250 micrometers in diameter as models of the water droplets. The half-radiance width of the reconstructed wave-front radiance distribution is shown theoretically to increase linearly as the distance of the object from the hologram is decreased; the half-radiance width increases logarithmically with hologram area. Theoretical and experimental radiance distributions in the plane of reconstruction are compared. Proper alignment of the holcgram during reconstruction is necessary for the reconstruction of the original radiance distribution. Size can be measured by noting edge enhancement (radiance peak at the edge of the droplet) in the reconstructed image. A relationship between the diameter of the peak and the actual droplet diameter is determined for sphere diameters from 20 to 250 micrometers and object distances from 10 to 20 cm. Experimental accuracy to within 4% is achieved with this technique.

7939 APTIC NUMBER 19287

Stockton, Edward L.
EXPERIENCE WITH A COMPUTER ORIENTED AIR MONITORING PROGRAM. J. Air Pollution Control Assoc., 20(7):456-460, July 1970. 2 refs.

Allegheny County's change over from an air monitoring network which formerly consisted of 32 stations equipped with lead candles and 44 sites equipped with dust fall cans to a continuous monitoring system of only 17 remote stations is described. Because of wide variations in wind direction and speed between valleys and hilltop plateaus, some stations are located in valleys and some on the adjacent hilltops. Other stations were chosen to evaluate specific emissions from known industrial, transportation, and power plant sources. Half the stations are along the Monongahela River, the most heavily industrialized area in the county. Data from two sites in relatively clean areas will provide information on background levels and reflect changes in pollution with corresponding meteorological changes. Plans call for 103 sensors, each selected on the basis of known or anticipated emissions in the area of a station. Telemetered data from the sensors is processed by an IBM 1801 which issues hourly printouts of individual sensor readings. The computer is also able to provide five-min printouts when pollution levels exceed air quality standards stored in the computer. The printouts continue until levels return to normal. Plans for expansion of the network, which is compatible with State and Federal Networks, are discussed.

7940 APTIC NUMBER 19817

Suito, Eiji, Masafumi Arakawa, Hideo Nishisa, Syozo Yano, Syohei Ishida, and Kazuhiro Hayashida
THE EFFECT OF THE PARTICLE SHAPE ON THE MEASUREMENT OF PARTICLE SIZE DISTRIBUTION. (Ryudosokutei ni okeru ryushikeijo no koka). Text in Japanese. Zairyo(J. Soc. Materials Sci., Japan), 19(201): 58-63, June 1970. 3 refs.

The microscopic method has an unequaled advantage over all other methods for measuring particle size distribution in that it can simultaneously determine both the particle size and the particle shape. By means of a Shimadzu Type SF-10 particle size frequency analyzer for microscopes, particle size distribution was obtained in terms of both the length diameter and the mean diameter of the sample particles. At the same time, the particle size with respect to Stokes' diameter was obtained by means of a Shimadzu Type RS-11 recording sedimeter (specific gravity balance). Various data for samples such as alpha-alumina, yellow iron oxide, fly ash, mica powder and glass balls are tabulated, and graphical analyses are provided with respect to the effect of particle shapes on the particle size distributions.

7941 APTIC NUMBER 19320

Tada, Osamu
ON THE METHODS OF EVALUATING THE EXPOSURE TO SOME CHLORINATED HYDROCARBONS. Rodo Kagaku (Journal of Science of Labor), 45(12): 757-765, 1969. 26 refs.

Methods for determining the atmospheric concentration of chlorinated hydrocarbons and the urinary concentration of trichloroacetic acid (TCA) are discussed. Air measurements are necessary for the evaluation of the environmental conditions of the work place, and attention should be paid to the peak concentration of the vapor. In determinations of various chlorinated hydrocarbons, four kinds of colorimetric methods can be used with varying procedures of sampling and analysis. These include the alkali-pyridine one-phase method, alkali-pyridine two-phase method, alkali-pyridine-benzidine method, and the alkali dechlorination method. The alkali-pyridine method and the alkali-pyridine-benzidine method should be used for measuring urinary TCA, which is presumed to indicate the amount of solvent absorbed through the respiratory tract and the skin in daily work. Repeated exposures to trichloroethylene, perchloroethylene, or methylchloroform vapor cause an increase in the urinary excretion of TCA; the maximum level is reached in 4-5 days. The amount of TCA in urine is nearly proportional to the vapor concentration and the duration of exposure. The results of urinary TCA measurements are significant as indicators in evaluating the repeated exposure to chlorinated hydrocarbons. (Author conclusions modified)

7942 APTIC NUMBER 19516

Tajiri, T., T. Shitasawa, K. Harada, and I. Tasori
DEVELOPMENT OF SMOKE TELESCOPIC METER. (Haishutsoo baien enkakoo kanshikyo (S.D.M.) no kaihatsoo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):40, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A new measuring instrument to determine the smoke density, the smoke density meter (S.D.M.), was developed at the Government Resources Research Institute. It has a revolvable filter disc with a standard transmission rate, viewable from a telescope of 8.5 magnifications, so that the rate of light shielded by smoke can be compared. The filter disc consists of 13 kinds of filters combined, and can be adjusted through the dial from the outside of the body so as to obtain the approximate light shield rate. Adjusting both barrels of the telescope will enable one to get a clear image up to 800 m in distance. When smoke density is

measured by means of the Ringelmann chart (R.C.), the smoke alarm indicator (S.A.I.), and the dust tube method (D.T.) as well as the S.D.M., the S.D.M. gives better results. It has advantages such as measuring at a long distance, providing smaller individual errors, and being influenced less by the weather.

7943 APTIC NUMBER 21805

Takamatsu, Ruichiro and Kenji Kawada
AIR POLLUTION CONTROL (PREDICTION OF POLLUTION BY A MATHEMATICAL MODEL). (Taiki osen seigyo nitsuite (Sushiki moderu niyoru osen niyoru yosoku)). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(4):210-222, April 25, 1970. 3 refs.

A method of predicting pollutant concentration, which takes into account the stochastic nature of pollutants, is proposed, together with a control system based on the theory. The whole area of a city under consideration is divided into districts, each having a cylindrical shape complete mixing zone in which a monitoring station is located. The mass balance of the mixing zone with the outside gives the basis of the theory. The equation of mass balance contains parameters which are dependent on meteorological factors. This requires a prediction of meteorological conditions, rendering the whole system stochastic. In estimating air pollution as a function of time based on a system with random noise, three methods of data smoothing, filtering, and prediction are described. The mathematical model described was applied to air pollution estimation in Osaka, using the measured value of sulfur oxides at Osaka Tower on Dec. 1, 1968. The agreement between the predicted and observed values was fairly good. An optimum control of pollutants was also formulated, and a computation was carried out on two systems, one with a time lag and the other without the time lag. The former gave more control. It is concluded that the accuracy in parameter estimation should be improved and a more precise relation established between the amount of exhausts and concentration.

7944 APTIC NUMBER 21809

Tamori, I., T. Shirasawa, A. Taziri, K. Harada, and W. Inase
COLLECTION EFFICIENCY OF DUST TUBE. (Dust tube no hoshu kohlitsoo ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):39, 1969. 2 refs. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

In order to know the collection efficiency of the dust tube used for the concentration determination of dust in flue gas, a collection performance curve is obtained applying the theory developed in the field of air filters. Assumptions for this application are that (a) each fibre of the tube can collect dust without mutual interference; (b) the collection efficiency of a single fibre, n, can be related in logaritha to total collection efficiency, F; and (c) the collection mechanism is dominated by inertial collision and direct interception and is related to n. These assumptions are related to the particle diameter, filled layer thickness, void ratio, filled fibre diameter, and apparent velocity in the layer, and produces curves. These curves are compared with the experimental values obtained from the experiment using homogeneous aerosols.

7945 APTIC NUMBER 19384

Taylor, H. D.
THE CONDENSATION OF SULPHURIC ACID ON COOLED SURFACES EXPOSED TO HOT GASES CONTAINING SULPHUR TRIOXIDE. Trans. Faraday Soc., vol. 47:1114-1120, 1951. 8 refs.

Laboratory apparatus and techniques are described for sampling and analyzing the sulfuric acid condensing from a hot gas mixture of known water vapor and sulfur trioxide contents. The essential feature of the technique is the vaporization of sulfuric acid into an air stream of known composition and its condensation upon a surface held at a known temperature in such a manner that the condensate could be sampled and analyzed. Over the range of gas composition studied (from 60 to 600 ppm of SO3), the concentration of the condensate is not affected by the proportion of sulfur trioxide present. It is a function only of the surface temperature and the water vapor content of the gases and, independent of the latter, there is a peak in the rate of condensation at a surface temperature approximately 45-50 C below the dewpoint. The magnitude of this peak increases with increasing dewpoint. (Author abstract modified)

7946 APTIC NUMBER 21650

Thomas, Jerome F., Eldon M. Sanborn, Mitsuqi Mukai, and Bernard D. Tebbens
IDENTIFICATION OF ALDEHYDES IN POLLUTED ATMOSPHERES AND COMBUSTION PRODUCTS. A.M.A. Arch. Ind. Health, 20(5):420-428, Nov. 1959. 11 refs. (Presented at the Am. Chem. Soc., 134th Natl. Meet., Air Pollution Symp., Chicago, Ill., 1958.)

A method is described for the analysis of a mixture of aldehydes contained in an aqueous solution. Methone (5,5-Dimethyl-1,3-cyclohexanedione) reacts rapidly and in large yields with most simple aldehydes to form bis-methone derivatives which in turn can be dehydrated to xanthene derivatives. These derivatives can be readily separated by means of fractional sublimation, and by means of melting points and infrared spectroscopy, the identification of individual aldehydes is accomplished. Formaldehyde was the only aldehyde whose presence could be positively ascertained in freshly collected samples obtained from natural polluted atmospheres. Relatively large quantities of formaldehyde were detected during periods of low humidity, while during periods of high humidity only very small quantities could be detected. Formaldehyde was present in gross amounts and was the only aldehyde detected in both the gaseous phase and particulate component of the stack effluent of simple hydrocarbon fuels burned under conditions of incomplete combustion. The total aldehyde production appears related to the primary and secondary air flow. Large quantities of formaldehyde may be produced even during the apparently complete combustion of simple hydrocarbon fuels. The amount produced is proportional within limits to the amount of secondary air. (Author summary modified)

7947 APTIC NUMBER 21818

TNO, Delft (The Netherlands), Research Inst. for Public Health Engineering
REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF POLLUTANTS IN INDOOR AIR, ATMOSPHERIC AIR AND IN WATER. 15p., June 1969.

Methods of determining pollutants in indoor air, atmospheric air, and in water are reviewed in the form of an alphabetical list of pollutants. The medium with each pollutant is noted and the appropriate analytical method is specified. Also noted is the apparatus to be used in air sampling. Lower limits are given for the sensitivity of each analytical method in air and water. Reference is made to available working reports.

7948 APTIC NUMBER 19104

Tokiwa, Yoshiro
OUTLINE WORKSHOP SESSION E. SULFUR DIOXIDE. Preprint, California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 11p., 1970. 14 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

Basic data on the chemical and physical properties of sulfur dioxide and its physiological effects are outlined, in connection with its measurement as defined by California air quality standards, which are also stated. Measurement is considered in terms of sample collection, methods, accuracy, and calibration. Brief descriptions are given of the following categories of measurement methods: manual (colorimetric West-Gaeke, acid titration, and colorimetric starch iodide); continuous (conductimetric, colorimetric, amperometric, flame photometric, electrochemical membrane, and spectrometric); and cumulative total (lead peroxide candle, sulfation plate, alkaline plate, and high volume sampler). Data on reagent/absorber, range, sensitivity, and recorder size are presented tabularly for 17 commercial models of continuous SO2 analyzers.

7949 APTIC NUMBER 19105

Tokiwa, Yoshiro and L. Potter
PHILLIPS SO2 MONITOR. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 2p., 1970. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

Information on apparatus, measurement principles and characteristics, and interferences is given for the Phillips sulfur dioxide Monitor, which measures ambient levels of SO2 by bromine titration. A constant level of free bromine is continuously generated by electrolysis from a solution of potassium bromide and sulfuric acid. A sensor electrode detects the Br2 to Br(-) oxidation potential. A reference current is placed in opposition to the sensor current and the net signal is fed to an amplifier, the output of which is in turn connected to the bromine generator. The added current needed to restore the Br2 concentration from its lowered level caused by reaction with SO2 is proportional to the SO2 concentration. Detection limit is less than 0.004 ppm and accuracy with daily calibration is better than 0.01 ppm at less than 0.07 ppm.

7950 APTIC NUMBER 21908

Toliver, William H., Clyde G. Roach, Robert W. Roundy, and Paul E. Hoffman
LIQUID CRYSTALS. Aerospace Med., 40(1):35-39, Jan. 1969. 22 refs.

Trace contaminants generate a color response to cholesteric liquid crystals. Research that utilizes this application of liquid crystals for trace contaminants detection in closed inhabitable atmospheres is described. At present, there is no satisfactory trace contaminant detector system for the analysis of trace contaminants in habitable space cabin atmospheres. A short chronological and scientific development of liquid crystals, their nomenclature, and classification is given. Liquid crystal theory is considered with particular attention to optical properties. The apparatus for measuring liquid crystal response to various organic vapors is described. Molecular species used for trace contaminant detection which are considered include cholesteryl chloride, nonanoate, oleyl carbonate, butyrate and erucate and their mixtures. A new molecular species 3 Beta-Carboxy-5-cholestene which is specific for aliphatic and aromatic acids is considered. (Author abstract)

7951 APTIC NUMBER 19299

Tomisawa, Misao
AIR POLLUTION OF WINTER IN TOKYO. (Tokyoto hankagai niokeru toki taikiosenjokyo). Text in Japanese. Kenchiku Setsubi (Architectural Equipment), no. 216:89-95, June 1969.

This study discusses major pollution sources, types of contaminants, and the present status of air pollution in Tokyo. Annual sulfurous gas concentrations are compared, as are annual variations in maximum sulfurous gas concentrations, monthly variations, and wintertime concentrations. Also noted are the frequency of issuance of smog alerts, trends in carbon monoxide emissions, levels of engine exhaust emissions at traffic intersections, and measures for controlling sulfurous gas and engine exhaust emission. As pointed out in many studies, the major contaminant sources are plant chimneys emitting SO2, SO3 and smog dust; facilities producing noxious gases such as ammonia and sulfuretted hydrogen; and motor vehicles producing carbon monoxide, oxides of nitrogen, and hydrocarbons. Although the pollutants which increase in winter are generated in heating boilers, meteorological factors contribute to accelerating their concentration. Atmospheric inversions which prevent pollutants from vertically dispersing are observed to occur nearly every day during winter. Data on measured annual and monthly variations of sulfurous gas and motor vehicle exhaust

are presented in the form of tables and graphs.

7952 APTIC NUMBER 21761

Tomizawa, Toshi, Osamu Shimoda, Takayuki Mizuno, Taiji Arai, Teruo Seki, Tyuhei Asakawa, and Ken-ichi Oda
AN ANALYTIC APPROACH TO THE EFFECTS OF ATMOSPHERIC POLLUTANTS OF THE CONDUCTIVITY OF ABSORBING SOLUTION. Electric Central Inst. Foundation (Japan), Engineering Dept., p. 1-18, Technical Experimental Institute Rept. 69022, Aug. 1969. 6 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 26p., April 6, 1970.

An atmospheric pollutant surveyor measures sulfur dioxide by passing the collected atmosphere into a solution containing 0.006% H2O2 and (5 times 10 to the minus 5 power) normal sulfur oxide to produce sulfuric acid. Since there are other components in the atmosphere which may be absorbed and affect solution conductivity, the absorbing solution was analyzed for the presence of the suspected ions and their effect on the conductivity of the solution determined. Ions considered were SO4(--), Cl(-), K(+), Na(+), Ca(++), NH4(+), Mg(++), and NO3(-). Densities of each ion were obtained using ion exchange analysis techniques. A 5% density fluctuation coefficient was observed as a result of the adsorption of these minor constituents. The conductivity ratio of the original absorbing solution was determined to be 24.8 micro-ohms/cm. A difference of 0.4 micro-ohms/cm was observed for the test solution.

7953 APTIC NUMBER 21861

Toyama, T. and M. Kusunoto
SEMIQUANTITATIVE MICRO RING OVEN ANALYSIS OF PARTICLE DIFFERENTIATED BY CASCADE CENTRIPITER. (Cascade centripter ni yoloo lyukei iki betsoo saishu lyushi shilyo no ring oven bilyo han teilyo boonseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):34, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The calibration, collection efficiency, and accuracy in the measurement of mass distribution of particles by a cascade centripter have previously been reported. A chemical analysis of particles in each group classified by diameter collected by the cascade centripter was now performed by means of the ring oven technique. Since a glass fiber filter is used as a collector in the cascade centripter, it can be used directly for ring oven analysis, which reduces steps of the procedure. Since the ring oven technique can analyze in very high sensitivity and at a good speed, it would match well the cascade centripter, which finds the mass distribution of particles very easily and rapidly.

7954 APTIC NUMBER 19233

Ueda Kou, and Hiroshi Yamamoto
AGGLOMERATION PHENOMENA OF PARTICLES OF POWDER SUSPENDED IN AN AIR STREAM. (Kiryuchu niokeru funtai no gyoshugensho). Text in Japanese. Funtai Kogaku Kenkyu Daishi (J. Res. Assoc. Powder Technology, Japan), 7(3):183-186, June 1, 1970. 1 ref.

Particles suspended in an air stream have a tendency of moving together as apparently large particles. To investigate the agglomeration phenomenon of powder particles it is necessary to measure the size distribution of the elementary particles which constitute an agglomerated apparently large particle. A horizontal wind tunnel was used for this purpose. Spherical glass powders, white alundum, and fly ash were used as sample powders, and were introduced into the tunnel by an electromagnetic hopper through a mixer. To the effect of the size distribution of the sample powder, the agglomeration rate and relative particle size were employed to reduce the experimental data. The agglomeration rate function was determined by the material and operating condition, regardless of agglomerated apparent particle size under a certain limit. For spherical glass, white alundum, and fly ash, the agglomeration rate function was approximated by a logarithmic probability distribution. It was found that minute particles are not the only ones which agglomerate to form apparently large particles. This study provides a clue for the analysis of fractional sorting efficiency.

7955 APTIC NUMBER 19685

Vanag, G.
COLOR REACTION WITH CARBAZOLE, INDOLE, PYRROLE AND SOME OF THEIR DERIVATIVES WITH BROM-NITROINDANDIONE. (Tsvetnye reaktsii karbazola, indola, pirrola i nekotorykh ikh proizvodnykh c bromnitroindandionom). Zh. Analit. Khim. (Moscow), 9(4):217-219, 1954. 1 ref. Translated from Russian. Belov and Associates, Denver, Colo., 5p., April 15, 1970.

A study was conducted to clarify the selective action and sensitivity of the reaction between carbazole and 2-brom-2-nitroindandeione-1,3. A carbazole solution in a glacial acetic acid medium produces an intensive red color with 2-brom-2-nitroindandeione-1,3. The color intensity depends on the carbazole concentration, the quantity of brom-nitroindandeione, and the duration of heating. Many other solvents were studied besides glacial acetic acid. Isoamyl alcohol with brom-nitroindandeione produced a red color. No red color was obtained with 3-nitrocarbazole or 3,6-dinitrocarbazole. Indole produces a red color, in the absence of carbazole, without heating. Pyrrole produces a red-violet coloring with brom-nitroindandeione in a glacial acetic acid medium with heating. The coloring reactions of many other amino acids were also investigated. It is concluded that 2-brom-2-nitroindandeione in a glacial acetic acid solution produces a characteristic colcring with many compounds containing pyrrole rings.

7956 APTIC NUMBER 19543

Vanag, G. Ya. and M. A. Matskanova
COLOR REACTIONS OF NITROINDANDEIONE COMMUNICATION II. REACTIONS WITH INDOLES AND CARBAZOLE. (Tsvenye reaktsii nitroindandiona). Zh. Analit. Khim. (Moscow), 13(4):485-486, 1958. Translated

from Russian. Belov and Associates, Denver, Colo., 8p., April 5, 1970.

The reactions of indoles and carbazole with 2-nitroindandeione-1,3 are discussed. Indole and its homologs produce very intensive coloring with nitroindandeione, often without heating. If a drop of diluted alcohol solution of indole is added to a saturated, aqueous solution of nitroindandeione, there is an almost instantaneous appearance of red color. If the indole solution is not diluted, a red sediment is produced. A more sensitive reaction with nitroindandeione is produced by 7-methylyndol. A red color appears, and with terminal dilutions, an orange hue is produced. Carbazole, with nitroindandeione in al alcohol solution, with heating produces an orange color. For the completion of the reaction, nitroindandeione is added in a dry form to an alcohol, glacial acetic acid, or water solution and then agitated. In the presence of indoles, a color soon appears. The solution is heated if no color appears. The appearance of color only with heating indicates a very small concentration of indoles or pyrroles, or the presence of displaced 2 and 3 indoles, or the presence of carbazoles. It is concluded that 2-nitroindandeione gives specific colors with indole, its homologs, and carbazole in alcohol, acetic acid, and water solutions. With indoles, color develops without heating.

7957 APTIC NUMBER 19157

Veress, S. A.
STUDY OF THE THREE DIMENSIONAL EXTENSION OF POLLUTED AIR. (FINAL TECHNICAL REPORT). Washington Univ., Seattle, Dept. of Civil Engineering, PHS Contract AP-00[illegible]1-01, 68p., 1970 (?). 22 refs.

A feasibility study was undertaken to investigate the possibility of recording and mapping polluted air masses by remote sensing with aerial photography as a recording medium. A theory of photographing polluted air masses was established. The theory indicated, and practical examples confirmed, that the polluted air masses was established. The theory indicated, and practical examples confirmed, that the polluted air mass could be effectively photographed using the polarization properties of aerosols with the techniques developed. The dimensions, horizontal and vertical, of polluted air masses were established from aerial photographs. Using vertical photographs, the horizontal accuracy was plus or minus 10-20 ft at the source of industrial pollution, decreasing to plus or minus 20-50 ft where the concentration of pollution becomes diluted to about 500 microgram/cu m. The accuracy of elevation was about plus or minus 8-19 ft at the source and decreased to plus or minus 100-150 ft at about 2-1/2 mi from the source. Oblique photographs were used to determine the elevation of the lower and upper surface of the plume cone. The accuracy of these measurements was about plus or minus 20 ft up to 6 mi from the source where the concentration was 150-200 microgram/cu m. The concept was extended by incorporating the horizontal extension of photographically detectable polluted air and the prevailing meteorological conditions throughout the year with the channeling effect of the local topography, to obtain the yearly distribution of polluted air mass. The accuracy of this process was plus or minus 20% of the area affected. Qualitative evaluations of the photographs is possible by the use of a microdensitometer. The relations of the mathematical functions developed and the actual measurements were excellent with a maximum correlation coefficient of 92% and a minimum of 61%. Extinction coefficients were determined photogrametrically. They differed from the measured values by between 5 and 10% of their values. The stability of the system has not been conclusively tested. However, it would appear that the variation between different flights would be small if exposure and processing is done under controlled conditions. The approximations which were introduced during the mathematical process have a relatively small effect on the final results due to the fact that in the establishment of theory, fractional elements of relative quantities were used rather than differences of absolute values.

7958 APTIC NUMBER 19047

Vetter, H.
COMPARATIVE LONG-DURATION TRIALS OF DUST CONCENTRATION RECORDING INSTRUMENTS IN THE FLUE GASES OF BROWN COAL-FIRED POWER PLANTS. (Vergleichende Dauerbetriebserprobung von Staubdichtemessgeraeten hinter Braunkohlenfeuerungen). Text in German. Mitt. Ver. Grosskesselbesitzern, 49(1):23-27, Feb. 1969. 7 refs. (Presented to the VGB, Emissions Meet., Munich, 1967).

In three different soft coal-fired power plants, eight dust concentration units measuring the light extinction of three different manufacturers were tested for a period of three months. Gravimetric calibration measurements were taken at the beginning and end of tests. None of the units survived the test period without trouble or failure, and two instruments were entirely replaced after half the test period had elapsed. High deviations between the extinction and gravimetric measurements are explained by the varying grain size distribution of dust, its changing location, temporal changes of its surface properties, shape and density distribution, which consequently change the optical properties, varying water vapor content, and finally a low water vapor dew point. Causes for trouble such as the non-uniform soiling of the transmitter and reflector parts, as well as the formation of flue gas condensate in the transmitter and reflector casings, could be eliminated. The question whether extinction measurements are as reliable for soft coal-fired boilers as gravimetric measurements was not solved by the tests.

7959 APTIC NUMBER 19099

Vettig, K.
THIN-LAYER CHROMATOGRAPHY OF QUINONES OF SOME POLYCYCLIC HYDROCARBONS. (Tonkosloinaya khromatografiya khinonov nekotorykh politsiklicheskikh uglevodorodov). Hyg. Sanit. (English translation of: Gigiena i Sanit.), 29(12):65-66, Dec. 1964. 9 refs.

Using thin-layer chromatography, the following quinones were investigated: benzoquinone, 9,10-anthraquinone, 1,2-chrysene-quinone, 3,8-pyrene-quinone, 3,10-pyrene-quinone, 3,4-benzpyrene-5,8-quinone, 3,4-benzpyrene-5, 10-quinone, and 5-nitropyrene-3, 8-quinone. The procedure for separation involved silica gel D with water and alcohol in a ratio of 3:6:1. Using

special instruments, uniform gel layers of 250 u were applied to 4 glass slides lying side by side. After air-drying for one hr, the slides were activated at 110 deg for 10 min. After cooling, quinone drops dissolved in benzene were applied to the starting line. Benzene-acetone and benzene-methyl ethyl ketone, substances which differ in their characteristic colors, were used as solvents. A particularly good separation of pyrene and benzpyrene-quinone was obtained.

7960 APTIC NUMBER 21850

Wachal, A. L.
EXHAUST GAS ANALYSIS. Automobile Engr., vol. 45:295-300, July 1955. 14 refs.

Apparatus and techniques are described for measuring air/fuel ratios encountered in gasoline engine practice. Both methods are based on the oxidation of carbon monoxide in exhaust gas. The first method, which employs a modified Orsat analyzer and which is best suited for laboratory analysis, involves the oxidation of carbon monoxide to carbon dioxide by dehydrated iodine pentoxide and fuming sulfuric acid. The iodine liberated by the process causes the reagent to become tinted, thus assisting in the approximate estimation of carbon monoxide contents below 0.1% while providing a positive indication of termination of the reaction. Following oxidation, the total carbon monoxide and carbon dioxide in the original sample are estimated by the reduction in volume after absorption in caustic potash. The air/fuel ratio is then read directly from a carbon monoxide plus carbon dioxide curve. Both portable and laboratory analyzers are provided with safeguards against accidental spillage and mechanical damage of the reagent. In a method suitable for continuous analysis and road tests, the reagent is anhydrous iodine pentoxide, which is contained in two stainless steel reactors to which the exhaust gas is passed. The light absorption of the gas leaving the reactors is determined photoelectrically and then related to the air/fuel ratio.

7961 APTIC NUMBER 21955

Warneck, Peter, J. W. Driscoll, and C. Matthews
STUDY OF THE APPLICATION OF A PHOTOIONIZATION MASS SPECTROMETER TO ANALYSIS OF CONTAMINANT GASES. GCA Corp., Bedford, Mass., Contract NAS 1-7794, Rept. GCA-TR-69-10-N, 65p., May 1970. 13 refs.
CFSTI: NASA CR-1589

Thirty-two gases and vapors were investigated with the photoionization mass spectrometer. Fragmentation patterns were determined at the ionizing wavelengths 803, 950, 1048, and 1216 A, respectively, making use of strong line sources. The possibility of discriminating between isomeric substances by varying the wavelengths existed for the butenes and butylalcohols, but not for the xylenes. In addition to fragmentation patterns, the mass spectrometric sensitivities and detection limits were determined to evaluate the potential of the photoionization mass spectrometer technique for trace gas analysis. With presently available light sources, detection limits are about 10 ppm, in agreement with previous results. An assessment is made to show that the detection limits can be improved. The feasibility of using this technique for the analysis of space cabin atmospheres, using solar ionizing radiation, is demonstrated. (Author summary)

7962 APTIC NUMBER 17733

Watanabe, Masuzo, Saburo Tazawa, Sachio Kubo, and Masayasu Makihara
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 58. COMPARISON OF THE PERFORMANCE OF VARIOUS GASEOUS HALOGEN COMPOUNDS AS TRACERS IN WASTE GAS DIFFUSION. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 8p.

Experiments and investigations were conducted with sulfur hexafluoride, freon-13B, freon-C318, and freon 114 to determine their effectiveness as tracers in waste gas diffusion. Sulfur hexafluoride is the most excellent. The sensitivity of sulfur hexafluoride to an electron capture type detector is very good, attaining a value about 68 times as large as that of freon-12. It is about 6.8 times as economical as freon-12. Sulfur hexafluoride does not need an evaporator when injected into a flue, because of its low boiling point, and because large amounts need not be released. The retention time of sulfur hexafluoride is very short; the time of measurement is about 10 minutes. In contrast, in other tracers the retention time is so long that the effect of the pre-cut device is reduced, making the measurement of many samples disadvantageous. It is expected that freon-13B and freon-C318 can be used as multitracers when they are in combination with sulfur hexafluoride.

7963 APTIC NUMBER 19313

Webb, J. C., J. C. Kinchen, and J. F. Scarberry
AERIAL SAMPLING BY HELICOPTER USING A HIGH VOLUME SAMPLER. J. Air Pollution Control Assoc., 20(7):453-455, July 1970. 8 refs.

A method of sampling the atmosphere for particulate matter at various elevations above an urban area is described. Tests were conducted using a high-volume air sampler mounted on a helicopter. The glass fiber filters, used to collect the aerosols, were analyzed for total particulates, benzene solubles, and the metals lead, copper, iron, and zinc. At 400 ft, the amount of aerosol pollutant was 20% of the ground level average. At 800 ft, the particulate concentration was 8% of the ground level average. At 800 ft, the particulate concentration was 8% of the ground average. Iron, lead, copper, and zinc were found in measurable quantities at each sampling level. This indicates that metal compounds of aerosol size and originating from ground sources are transported to the upper air by the atmospheric diffusion process. These tests show that a high-volume air sampler, mounted on a helicopter, can be used to obtain the data needed to evaluate the air quality and to control the air pollution over an urban area.

7964 APTIC NUMBER 19369

Whitby, Kenneth T. and B. Y. H. Liu

ATMOSPHERIC PARTICULATE DATA - WHAT DOES IT TELL US ABOUT AIR POLLUTION? Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service,

Washington, D. C., National Air Pollution Control Administration, 17p., 1970. 15 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

Highlights of the knowledge gained from several decades of particulate measurement are reviewed, with respect to the suitability of common methods for measuring particulate air pollution. In addition, evidence is presented indicating that the vertical distribution of particle mass may be an important factor in the interpretation of particulate measurements, especially by mass. The general characteristics of atmospheric particulate matter are described. Measurements of the mass concentration of particulate matter in the lower few hundred feet of the atmosphere which have been made in most major cities during the last 15 years, are critically evaluated. Geometric standard deviations and mean annual concentrations are discussed, as well as efforts to determine natural background mass concentrations. When data on urban aerosol particle size distributions are considered, it is observed that the concentration in the 'respirable' range (about 0.1-2 micrometers) may be the best index of general particulate air pollution. Measurements of airborne particulate concentration by the dust spot method are discussed, and recommendations for subjects and priorities in future research are made.

7965 APTIC NUMBER 19402

Whitby, Kenneth T. and Benjamin Y. H. Liu
ATMOSPHERIC AEROSOL SIZE DISTRIBUTIONS. SUMMARY OF RESEARCH. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley; Public Health Service, Washington, D. C., National Air Pollution Control Administration, 12p. 1970. 28 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., 1970.)

Results of a 5-year research program for the development of improved instrumentation for the measurement of aerosol size distributions are summarized. Design and/or modifications are reported of an aerosol analyzing system, a mobility analyzer, and an electrostatic aerosol sampler for light and electron microscopic studies. Urban studies are described in which these instruments were used to investigate aerosol size distribution and concentration, vertical distribution, and the effects of micrometeorological variables. Laboratory studies are in progress of aerosols produced by atomization from a spray can of DOP in Freon and from combustion sources such as cigarettes, matches, and auto exhaust; preliminary results are given. The theory of urban aerosol size distribution and concentration is reviewed in detail, including a report of theoretical studies and comparisons of the data with the 'self-preserving' size distribution.

7966 APTIC NUMBER 21743

Whitby, K. T. and B. Y. H. Liu
GENERATION OF COUNTABLE PULSES BY HIGH CONCENTRATIONS OF SUBCOUNTABLE SIZED PARTICLES IN THE SENSING VOLUME OF OPTICAL COUNTERS. J. Colloid Interface Sci., vol. 25:537-546, 1967. 8 refs.

Large numbers of subcountable particles in the sensing zone of single particle optical counters generate spurious counts in the counting range of the instrument. A statistical theory has been developed which is capable of predicting the size distribution and number of the spurious pulses from the concentrations and particle size of the subcountable aerosol. The theory has been extended to atmospheric aerosols, and it is shown that many subcountable particles present in atmospheric aerosols can account for the false mode often observed when single particle optical counters are used to size concentrated urban aerosols. Numerous subcountable residue particles present in the atomized polystyrene latex aerosols can generate spurious pulses in the lower channels, thereby affecting the accuracy of this calibration method. (Author abstract modified)

7967 APTIC NUMBER 19072

Widhopf, George F. and Samuel Lederman
SPECIE CONCENTRATION MEASUREMENTS UTILIZING RAMAN SCATTERING OF A LASER BEAM. Polytechnic Inst. of Brooklyn, Farmingdale, N. Y., Dept. of Aerospace Engineering and Applied Mechanics, ONR Contract Nonr 839(38) and AWO Contract DAHC04-69-C-0077, ARPA Order 529 and 1442, PIBAL Rept. 69-46, 93p., Nov. 1969. 27 refs.
CFSTI, DDC: AD 701343

The feasibility of utilizing Raman scattering as a diagnostic technique to measure individual specie concentrations in typical gas mixtures found in gas dynamic applications was investigated. Either the local density of a pure gas or the concentration of individual diatomic (or polyatomic) species in a gas mixture can be uniquely determined. The range and limitations of this technique were evaluated under controlled static conditions. The species investigated included oxygen, nitrogen, carbon dioxide, and methane. A description of the pertinent theory and concepts of Raman scattering is included. Measurements of the vibrational temperatures of oxygen were made. Fair agreement between theory and experimental results was obtained for spectrographic measurements and very good agreement was obtained for measurements made using narrow bandpass filters. (Author abstract modified)

7968 APTIC NUMBER 19348

Williams, Frederick W., Merle E. Umstead, and J. Enoch Johnson
DETERMINATION OF TRACE QUANTITIES OF HALOGENATED HYDROCARBONS IN GAS SAMPLES. Naval Research Lab., Washington, D. C., Fuels Branch, NRL Problems C08-30 and C08-33, Proj. SF35-433-002-13215, 13213, S4607-11897, NRL Rept. 6964, 18p., Nov. 6, 1969. 9 refs.
CFSTI, DDC: AD 698120

By making use of an on-column concentrating technique and a coulometric detector specific for certain elements, gas samples can be analyzed quantitatively for chlorinated contaminated

compounds at concentrations as low as 10 to 20 parts per billion by volume. Halogenated organic solvents are of particular concern in closed atmospheric situations such as nuclear submarines, spacecraft, and hyperbaric chambers due to their corrosive and toxic potential. The Dohrmann microcoulometric detector, with a silver cell and operating in the oxidative mode, is specific for halide ions, except for fluorides. As the hydrocarbon components of the mixture are eluted from the chromatographic column, they are pyrolyzed in an oxygen stream at 950 C, thus rendering the halogen titratable with silver ions. When related through Coulomb's law, the response of the detector is an absolute quantitative measure of the chloride ions present. The good separation possible with the Porapak column helps eliminate slow response of the coulometer, so there would not be interference of one peak with the next, and it makes unnecessary the use of cold traps. Multiple-step temperature programming is possible, which within a reasonable time permits the analysis of chlorinated compounds in a wide boiling range.

7969 APTIC NUMBER 21820

Williams, David T. and Robert M. Hager
THE DERIVATIVE SPECTROMETER. Preprint, Florida Univ., Gainesville, 31p., 1969 (?). 14 refs.

The theory and performance of a small portable second-derivative spectrometer are described. The physical principles of the apparatus permit detection of gases by absorption spectrometry with sensitivities two or more orders of magnitude greater than is attainable by use of conventional spectrometers. When the spectrometer is used with a readily portable absorption cell having a 7.72-meter folded light path, some common air pollutants are detectable in concentrations of parts per billion or less. Other designs of absorption cell permit measurement of ammonia in blood or in expired air. (Author abstract)

7970 APTIC NUMBER 21925

Williams, M. B. and J. Janata
THERMOMETRIC TITRATION OF SULFATE. Talanta, 17(6):548-551, June 1970. 7 refs.

Direct thermometeric titration of sulfate with a solution of barium perchlorate is proposed. The stoichiometry of the titration is critically dependent on the concentration of ethanol in the titration medium. The titration is rapid and suffers from only a few interferences. Accuracy is lower than in other instrumental methods. This might be due to the fact that the short titration time which is required for the semi-adiabatic arrangement is not long enough for barium sulfate to be formed exactly stoichiometrically, because of adsorption phenomena which occur during the precipitation. (Author summary modified)

7971 APTIC NUMBER 19385

Wilsdon, B. H. and P. J. McConnell

THE MEASUREMENT OF ATMOSPHERIC SULPHUR POLLUTION BY MEANS OF LEAD PEROXIDE. J. Soc. Chem. Ind., vol. 5:385T-388T, Dec. 21, 1934. 7 refs.

A method of employing the reaction between a dry paste prepared from lead peroxide and sulfur dioxide for the measurement of the sulfur pollution of the atmosphere is described. The rate of sulfation is proportional to the concentration of SO2 up to high percentages of sulfation. When the paste is applied to cylinders, for small velocities, the rate of absorption varies inversely as the fourth root of the air velocity. The variation in rates of absorption due to this cause and to temperature changes was estimated and compared with the range of variation calculated statistically from two years' observations, during which both the lead peroxide and volumetric methods were employed. The variation observed is greater than that attributable to wind and temperature, and is probably dependent on errors in the volumetric method and to differences in the exposure at the points of observation. It is concluded that the lead peroxide method, in addition to affording a reliable means of estimating the relative 'activity' of atmospheric SO2, may provide a simple method of estimating prevalent concentrations of SO2 if exposures are made under conditions which enable corrections to be applied for the effects of wind velocity and temperature. (Author summary modified)

7972 APTIC NUMBER 19432

Winefordner, James D.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF FLAME SPECTROMETRIC METHODS AND GAS CHROMATOGRAPHIC DETECTORS. (FINAL SCIENTIFIC REPORT). Florida Univ., Gainesville, Dept. of Chemistry, Contract AFOSR-69-1685, Proj. 9536, Task 611102F, Work Element 681303, Rept. AFSOR 70-0350TR, 17p., Feb. 1, 1970. 49 refs.
CFSTI, DDC: AD 701095

Fundamental, instrumental, and methodological studies were directed towards a goal of improved methods of trace analysis of elements and molecules in gases and solutions. Four major areas of research included atomic emission, atomic absorption, atomic fluorescence flame spectrometry, and the development of selective gas chromatographic detectors. Derived radiance expressions were used to predict the shapes of 'growth' curves (log radiance vs log atomic concentration) and the shapes of analytical curves (log signal vs log sample concentration). Derived signal-to-noise ratio expressions in terms of spectral, flame gas composition, and instrumental parameters were used to predict optimum experimental conditions producing the maximum signal-to-noise ratio and the minimum limits of detection for a given element measured using a given flame, a given instrument, and a given method. The nebulization process was studied by measurement of the efficiency of aspiration of droplets in the flame gases. By means of a statistical design approach, the critical instrument parameters for achieving maximum sensitivity and precision in analytical flame methods were determined. Trace concentrations of permanent

gases in a carrier gas were determined by measuring the decrease in signal from a flame emission detector. A derived signal-to-noise ratio expression for thypositive flame emission gas chromatographic detector was used to estimate the limits of detection for various trace impurity gases in a given carrier gas.

7973 APTIC NUMBER 12201

Winkler, G. L., S. S. Lestz, and W. E. Meyer
EXHAUST GAS SAMPLING TECHNIQUE FOR RELATING EMISSIONS AND CYCLE CHARACTERISTICS. Preprint, Society of Autoective Engineers, Inc., New York, 5p., 1968. 10 refs. (Presented at the National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 29-31, 1968, Paper 680770.)

Cycle-to-cycle variations of the combustion process of spark ignition engines, usually observed as peak pressure variations, are a phenomenon the causes of which have not yet been identified with certainty. For investigating whether or not there is a relationship between physical cycle characteristics, such as peak pressure, and exhaust gas composition, a sampling system was developed which collects bag samples from specified cycles only. It consists of an analog portion for obtaining pressure and rate-of-pressure change signals, a digital logic portion for discriminating between signals according to selected criteria, and an electrically actuated sampling valve in the engine exhaust system. Since signal analysis and discrimination are instantaneous, gas sampling is done during the exhaust stroke of the same cycle for which the logic generated the command to sample. Because there is a strong correlation between peak pressure and peak rate of pressure change, either can be used for measuring specific cycles. Preliminary tests indicate that separation of hydrocarbons varies according to the magnitude of the peak rate of pressure change. (Author abstract modified)

7974 APTIC NUMBER 20460

Yamamoto, Tadashi, Shozo Matsuda, Toshihide Okuno, Hideki Tanaka, and Masahiko Tsuji
OFFENSIVE ODORS. 5. ANALYSIS OF THE CONSTITUENTS OF OFFENSIVE ODORS EMITTED FROM PETROLEUM REFINERIES. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-59, 1967. Translated from Japanese. 3p.

An analysis of the offensive odors emitted by petroleum refineries is discussed. The samples which were analyzed included liquid fractions of petroleum collected and separated from an ejector drain of a reduced pressure distillation device; contact tower drainings from the sulfuric acid washing process; and odor constituents collected by active carbon adsorption. Gas chromatography was used for the analyses. The first two samples were heated to 40 C, and a definite quantity of the gas in the container was directly introduced into the gas chromatograph for qualitative analysis. More than 30 hydrocarbons were identified. For the confirmation of these components, the elimination process with H2SO4 and other chemicals was conducted at the same time. A comparative analysis of the gas volumes evolved at different temperatures of the sample was conducted by varying the heating temperature. The third sample was also analyzed by gas chromatography, and when compared with the other constituents, a correlation was found between the detected constituents. The low-boiling hydrocarbons showed qualitative agreement, but the high-boiling ones gave inconclusive results.

7975 APTIC NUMBER 21808

Yoshikawa, S., Fujie, T. Shiraki, and S. Nakano
DETERMINATION OF BENZO(A)PYRENE, BENZ(C)ACRIDINES AND 7H-BENZ(DE)ANTHRACEN-7-ONE IN AIRBORNE PARTICULATES. (Taiki hooyu hoonjin chu no Benzo(a)pyrene, Benz(c)acridine, and 7H-Benz(de)anthracen-7-one no sokooteihoh). Text in Japanese. (Taiki osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):109, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A method of quantitative analysis is presented for Benzo(a)pyrene (BaP), Benz(c)acridine (BcAcr) and 7-H-Benz(de)-anthracen-7-one (BO), which are considered to cause cancers in animals. Samples are collected on glass filters in a high-volume air sampler for 24 hours. The samples undergo extraction in a soxhlet extractor by benzene for 10 to 13 hours, until ultraviolet rays cannot detect any more fluorescent substances. After drying the extracted substances, they are extracted into cyclohexane solution. Other polycyclic aromatic hydrocarbons are transferred into nitro methane. To separate BaP, BcAcr, and BO from other substances, samples thus extracted and standards of the three compounds with activated alumina and silica as an absorbent and pentane and ether as a spreading agent are spread on the thin layer plate, where the portions fluorescing under an ultraviolet ray lamp of 3660 A are marked. These portions are scraped out, dissolved into benzene, and analyzed by means of fluorescent spectroscopy.

7976 APTIC NUMBER 21892

Zaromb, Solomon
REMOTE SENSING OF INVISIBLE AIR POLLUTANTS. (FIRST ANNUAL PROGRESS REPORT). Zaromb Research, Passaic, N. J., NAPCA Grant 1 RO1 AP 00516-01A1 APC, 57p., May 28, 1969. 59 refs.

A technique for sensing invisible air pollutants utilizes Lidar chiefly in conjunction with absorption spectroscopy. Resonance Raman scattering may also be used at selected wavelengths. Most other Raman or fluorescence techniques yield a sensing range of less than 100 meters for usual pollutant levels. Lidar absorption spectroscopy provides a relatively simple means of determining the average concentrations of such common pollutants as nitrogen dioxide, sulfur dioxide, and ozone at concentrations less than one part per billion, over a range of several kilometers, with modest ground-based instrumentation. A similar approach using air-borne equipment has been briefly investigated, and appears advantageous for obtaining concentration profiles over wide areas for most of the usual atmospheric trace constituents. A

ground-based lidar system under construction, comprising a Q-switched neodymium glass laser, will operate at up to twelve wavelengths deriving from the first four harmonics of the 1.06-micron radiation and from their Raman-shifted backscatter by atmospheric nitrogen and oxygen. Besides yielding twice as many wavelengths as the four harmonics, the Raman-shifted radiation facilitates discrimination between molecular absorption and atmospheric scatter. This system is expected to measure sulfur dioxide and ozone levels even in daylight and nitrogen dioxide levels at night under normal visibility. (Author abstract)

7977 APTIC NUMBER 12345

Alkire, H. I.
AIR POLLUTION IN GARRETT COUNTY MARYLAND. Maryland State Department of Health, Baltimore, Div. of Air Quality Control, 28p., March 1969. 12 refs.

The results of a preliminary survey of air pollution conditions, collected from existing data and personal interviews in Garrett County, Md., are presented. The county, the westernmost in the state, is the second largest in area but the most sparsely settled. Its topography, meteorology, and land use are described. Visual and odor observations and pollution measurements show that a serious air pollution problem exists in the Bloomington area in the valleys of the southeastern portion of the county. This problem originates outside the boundaries of the county, specifically in the Luke, Maryland - Beryl - Hampshire, West Virginia area. Bloomington School had suspended particulate at 135%, dustfall at 300%, and sulfation at 120% of satisfactory levels. The main sources of contamination in the Bloomington area are the paper mill at Luke, the charcoal plant in Beryl, and a coal screening operation in Hampshire. No measurements of air pollution have been made in the other portions of the county, but indirect indicators suggest that no serious air pollution problems exist, or are likely in the foreseeable future. Several recommendations are made for improving the pollution problems now existing.

7978 APTIC NUMBER 16271

Bouquiaux, J. and J. Grandjean
ATMOSPHERE POLLUTION, SMOKE AND SO2. Bull. Mens. Inst. Royal Meteorol. Belgique, 17p., June 1968. Translated from French and Flemish. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 17p., Sept. 26, 1969.

Tables and graphs of the average daily levels of smoke and SO2 pollution in Belgium are presented. The sampling apparatus consisted of a membranous electric pump that takes in about 2 cu m of air per day, a Whatman paper filter no. 1, a scrubber containing 50 ml of oxygenated water at a pH of 4.5, and a gas meter. The apparatus also included 8 filter-scrubber circuits that were automatically switched on each morning. Collection of samples was carried out once a week. Reflectometric analysis of the filter and acidometric testing of the liquid from the scrubber provided an average proportion of fumes and SO2 per cu m of air during the 24 hours of sampling. The network comprised 230 sampling stations. One hundred stations were located in the cities of Brussels, Antwerp, Liege, Charleroi, and Ghent; another 100 were located in less important cities and selected centers across the country; and 30 were located in meteorological stations equipped with anemometers. Analytical laboratories were located in the five large cities.

7979 APTIC NUMBER 19433

Bravo, H. and L. Corona T.
ATMOSPHERIC CONTAMINATION AND ITS RELATION WITH VEHICULAR FLOW IN MEXICO CITY. Universidad Nacional Autonoma de Mexico, Mexico City, Facultad de Ingenieria, 1969. 7 refs. Translated from Spanish. Relov and Associates, Denver, Colo., 27p., March 12, 1970.

A study was conducted to determine the degree of contamination expected in the air over Mexico City during the period of the 19th Olympic Games. Measurements were conducted through November 1968 in order to establish immediate comparison with the Olympic period. Recognizing that vehicular activity would be greatest in the areas adjacent to the games and other tourist attractions, the study attempted to obtain a correlation between the number of vehicles in circulation and the degree of contaminant concentration. At the same time, meteorological parameters that influence concentrations were measured. A set of analyses made on air filter samples during October and November 1968 is presented. Concentration of carbon monoxide and methane in the air samples and the total of suspended particulate matter and lead in the filters was also obtained. The concentrations of detected contaminants were correlated with transit parameters (velocity, flow, and vehicle concentration), taking into account the residual variables relative to meteorological phenomena. A regression equation to compute ppm carbon monoxide as a function of temperature, vehicle flow, and the amount of methane was derived. Contaminant concentrations indicated that a critical condition exists in Mexico City.

7980 APTIC NUMBER 21721

Carson, J. E., R. J. Votruba, and J. W. Lin
CHICAGO'S AIR POLLUTION INCIDENT CONTROL TEST, SUMMER 1968. In: Radiolcgical Physics Division Annual Report July 1968 through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 133-135, 1969. (Presented at the 62nd Annual Meeting, Air Pollution Control Association, June 25, 1969, New York.)
CFSTI: ANL-7615

Chicago's Department of Air Pollution Control, in cooperation with the Argonne National Laboratory, is developing an air-pollution abatement strategy based on asking major sulfur dioxide producers to convert to low-sulfur fuels during periods of poor ventilation. In June and July 1968, 48 industries participated in a switch-fuel test so that changes in air quality due to fuel changes could be determined and compared with changes computed from diffusion equations. This paper reports the data obtained for two days, one when industry converted to maximum use of high-sulfur fuel and one when it was asked to reconvert to minimum-sulfur fuel. On the first day, four of the eight monitoring stations reported rapid and large increases in SO2 (from 0.00 to 0.23 ppm in 15 min at one station). Fluctuations during the balance of the day were related to changes in wind direction. Very low ground-level concentrations were observed at night and early morning during the period with light winds and strong, ground-level inversions, showing that the pollutants were trapped above the stable layer and did not reach the surface. Two days later, when a lake breeze extended over the city and reconversion was effected, a SO2 concentration of 0.47 ppm was recorded at one station. This occurred several hours after

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the lake breeze front passed the station, indicating that the SO2 was trapped in the stable air moving in from the lake. No high SO2 levels were observed at any station in the zone of convergence along lake breeze front. The data show that sources outside the city are often responsible for high SO2 levels inside the city.

7981 APTIC NUMBER 19499

Endo, H., T. Kohgo, M. Sugawara, and T. Matsumoto
STUDIES ON THE URBAN ATMOSPHERIC POLLUTION BY AUTOMOBILE EXHAUST GAS IN THE CITIES OF HOKKAIDO (PART 2). ON THE MEASUREMENT OF CARBON MONOXIDE BY THE NONDISPERSIVE INFRARED SPECTROMETER. (Hokkai doh no toshi ni okeloo jidohsha haishutsoo gas no taikiosen ni tsooite (Dai 2 hoh) Sekigaisen jiki boonsekikei ni yoroo issankatanso nohdo no solootei ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):93, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The results from the measurements of carbon monoxide concentration through a non-dispersion type infrared spectrometer at road intersections in three cities (Tomakomai, Asahikawa and Sapplo) of Hokkaidoh in August are reported. In the latter two cities having high-rise buildings and weak winds at the time of measurement, the total average daytime carbon monoxide concentration exceeded 10 ppm, with the maximum value of approximately 45 ppm. The percentage of hours exceeding 10 ppm were more than 30% and those exceeding 20 ppm, 3%. In less compacted Tomakomai city with strong winds, the total average was 5.5 ppm with its maximum value of 14 ppm. The percentage of hours exceeding 10 ppm was 5.8%, and that exceeding 20 ppm, 0%.

7982 APTIC NUMBER 20008

Haines, Alan Everett
ISOTOPIC STUDIES OF ATMOSPHERIC METHANE, ETHANE, AND KRYPTON. Arkansas Univ., Fayetteville, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc., 1968, 57p. 40 refs.

Studies of the concentration and isotopic composition of trace gases in the atmosphere can give information on the sources and sinks of these gases and details on the circulation patterns of the atmosphere. The present study was initiated to obtain more data on atmospheric levels of tritiated methane. To determine the chemistry of tritium in the atmosphere, it was also necessary to investigate the presence of absence of tritium labeled ethane. To obtain methane of the desired purity, krypton was separated from methane. Since the krypton was available, the behavior of Kr85 was studied. The gases were obtained from liquid oxygen fractions collected at a nonindustrial site. Methane and ethane samples were analyzed for their stable isotope content as well as concentration. The methane data obtained shows that the tritium content of atmospheric methane has remained relatively constant from 1958 to 1967. This implies that the release of tritiated methane must be continuing in time, thus refuting the assumption that release ceased in 1958. The detection of tritiated ethane is strong support for the release of both methane and ethane by the nuclear industry. The Kr85 level in the atmosphere does not appear as high as previously thought. The level for three samples thought to represent a well-mixed global atmosphere was 240 dpm/mMole. Ethane was recovered carrier free and had a tritium level comparable to that methane. The stable isotope ratios are similar to those measured in atmospheric methane.

7983 APTIC NUMBER 21734

Haines, Alan and B. C. Musgrave
TRITIUM CONTENT OF ATMOSPHERIC METHANE AND ETHANE. J. Geophys. Res., 73(4):1167-1173, Feb. 15, 1968. 18 refs.

Samples of liquid oxygen collected at ground level were processed for recovery of methane, and the tritium content of these samples was measured. The fluctuation of the T/H ratio is discussed in terms of possible sources of this radioactivity. Arguments that the tritium-labeled methane was released from sources in the nuclear industry are supported by measurements of tritium in ethane recovered from some of the liquid oxygen samples. The continuing release of labeled methane by the nuclear industry is suggested by the fact that the T/H ratio has not changed appreciably during the period 1958 to 1966, although this interval is comparable to the chemical lifetime expected for methane in the atmosphere. (Author abstract)

7984 APTIC NUMBER 17720

Harada, Akira
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 45. METEOROLOGICAL ANALYSIS OF AIR POLLUTION IN SUMMER. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 3p.

A meteorological analysis of sulfur dioxide pollution in the summer is presented. The data used were those measured by an automatic measuring apparatus for SO2 installed at four measuring points in the Osaka plains. In general, the monthly average is high in winter, but sometimes a maximum appears in summer. High concentration in the daily average continues for several days in most cases. The occurrence time distribution of the high SO2 concentration for the hourly average varies from one measuring point to another. A high value is shown from 9 am to noon or in the afternoon when no inversion is supposed to form near the ground. It has been shown by a synthesized atmospheric pressure arrangement that a high SO2 concentration is most likely to occur when the area is covered with the high pressure of the Pacific Ocean.

7985 APTIC NUMBER 19533

Hoidale, G. B. and S. M. Smith
ANALYSIS OF THE GIANT PARTICLE COMPONENT OF THE ATMOSPHERE OVER AN INTERIOR DESERT BASIN. Tellus (Uppsala), 20(2):251-268, 1968. 21 refs.

An investigation of the mineral constituency of the dust

component of the atmospheric aerosol over south-central New Mexico was conducted from November 1964 to August 1965. The 81 atmospheric dust samples, taken near the surface during this period, were analyzed by dispersion staining microscopy to determine the concentrations of quartz, kaolinite, illite, gypsum, and the carbonate family within the 'giant particle' range (2.5-100 micron). High gypsum concentrations were rare, despite proximity to one of the world's largest exposed surface deposits of gypsum; kaolinite and illite concentrations increased with cold frontal passage from the east if the suspected source region was not snow-covered or water-soaked; and there existed seasonal variations in concentrations. Geometric mean particle concentrations for the 81 samples were: quartz, 8%; kaolinite, 8%, illite, 5%, gypsum, 3%, and carbonates, 10%. Comments are made relative to the possible influence of oceanic and extraterrestrial particles on the observed concentrations. (Author abstract modified)

7986 APTIC NUMBER 19600

Horton, A. D. and A. S. Meyer
GAS CHROMATOGRAPHIC DETERMINATION OF VOLATILE AIR POLLUTANTS. (ANNUAL PROGRESS REPORT FOR PERIOD ENDING OCTOBER 31, 1967). Oak Ridge National Lab., Tenn., Analytical Chemistry Div., Contract W-7405-eng-26, p. 30-32, Jan. 1968. 4 refs.
CFSTI: ORNL-4196

Analyses of volatile hydrocarbons in charcoal and air samples from nuclear reactor containments and various indoor and outdoor sites in the vicinity of Oak Ridge National Laboratory were carried out. Total hydrocarbons were determined by use of the flame-ionization detector; unsaturated hydrocarbons were determined on the same column by subtracting from the total hydrocarbons those that passed through a perchlorate olefin absorber. Data on oxygenated hydrocarbons were obtained by subtracting the hydrocarbons that passed through a 1% solution of NaHSO3 from total hydrocarbons. Identifiable hydrocarbons were determined with a column of 3 wt % squalane. Results of all determinations are given. Depending on the environment, the extent of contamination of air and of charcoal by volatile organic compounds varies from day to day or even from hour to hour. For outdoor samples, the concentration of contaminants is directly proportional to the density of automobiles operating in the immediate vicinity of the sampling point. Newer buildings, in general, are less contaminated than older ones.

7987 APTIC NUMBER 19268

Jacquemain, R., R. Remy, and M. C. Remy-Billon
GROWTH OF SULFUR POLLUTION, ESPECIALLY IN BESANCON, IN THE PAST FOUR YEARS. PARTIAL STUDY OF PONTARLIER AND ORNANS. (Evolution des pollutions sulfureuses et particulaires a Besancon durant les quatre dernieres annees. Etude partielle a Pontarlier et a Ornans). Text in French. Ann. Sci. Univ. Besancon Chim. (Besancon), 3-25, 1969. 4 refs.

A series of continuous air measurements have been conducted by the Besancon University School of Sciences, in cooperation with the local Bureau of Hygiene, since 1966, and more recently in the smaller towns of Pontarlier and Ornans, in the French Department of Doubs. Sulfur dioxide was determined by bubbling atmospheric air through a dilute solution of hydrogen peroxide. Simultaneously, particulate matter was collected on calibrated filter paper. In 1966, the maximum SO2 concentration recorded was 160 micrograms per cubic meter, and the maximum smoke recording was 140. In 1967, a maximum value of 500 micrograms SO2 was recorded. No such maximum was reached in 1968 or in 1969. The population of the inner city of Besancon is 97,853; the population density is 62.57 inhabitants per hectare. The city contains 28,354 hectares of public park land, or 2.18 square meters per inhabitant. Domestic heating accounts for 40-60% of the total pollution figure. In 1967, about half of all heating was done with gas. Coal consumption decreased 15% during 1967-1968, while fuel oil consumption increased by 15%. Domestic coal contains about 1% sulfur, of which about 80% is emitted into the atmosphere. This amounts to about 16 kg of SO2 for each ton of coal burned. The fuel oil sulfur content can be as high as 4%. Motor vehicles provide about 10% of the SO2, as compared with 80% of the CO. A counting of vehicles passing 18 check points revealed a 6.4% increase in 1967 over 1966. At one check point, the increase was as high as 10%. The study also included measurements with Owen gauges (organic and inorganic pollutants), Pagode apparatus, and the collection of dust samples on Teflon wool. The latter techniques were considered complementary to the first type of tests.

7988 APTIC NUMBER 19699

Kulkarni, R. N. and G. L. Gambhas
LONGITUDINAL VARIATION OF OZONE IN THE LOWER MIDDLE LATITUDES OF THE SOUTHERN HEMISPHERE. J. Geophys. Res., 75(21):4174-4176, July 20, 1970. 6 refs.

Marked longitudinal variation of total ozone is known to exist in the northern hemisphere, but because of the small number of monitoring stations, it is practically impossible to obtain a longitudinal or geographical distribution of ozone in the southern hemisphere. However, observations made since 1964 show that the amount of ozone at Pretoria, South Africa, is always smaller by 20-40 Dobson units than the amount at Brisbane in Australia. Umkehr analysis showed that the amount of ozone at Pretoria is less at all levels at all seasons, but the difference is much larger in the lower stratosphere in winter and spring. The fact that more ozone is observed over Brisbane, with the indication of a higher temperature at the 100-mb level, implies greater meridional transport in the Australian sector. This may be related to large disturbances connected with continental influences on heating and cooling.

7989 APTIC NUMBER 20022

Lindsey, A. J.
SOME OBSERVATIONS ON THE RELATIVE QUANTITIES OF AIR POLLUTANTS IN VARIOUS LOCATIONS. Nat. Cancer Inst. Monograph, no. 9:235-250, 1962. 63 refs.

Extensive study has been made of some constituents of the atmosphere, while other pollutants and groups of pollutants have been relatively neglected. Whereas attention has been focused on organic pollutants, in England at least the major constituents of total air solids are inorganic in nature. Amounts and proportions vary according to season, climate, and time of day, while the industrial picture changes constantly due to the imposition of legal restraints and the use of new materials. The state of knowledge as of 1961 regarding the total air solids composition of the atmosphere is summarized, with special attention to polycyclic aromatic hydrocarbons, arsenic, iron, germanium, lead, and vanadium. A list is given of 22 elements detected in ash captured from an urban atmosphere, and a 63-reference bibliography is given of works on combustion chemistry, tobacco-smoke, and atmospheric pollution.

7990 APTIC NUMBER 19822

Magno, P. J., P. P. Goulix, and J. C. Apidianakis
LEAD-210 IN AIR AND TOTAL DIETS IN THE UNITED STATES DURING 1966. Health Phys., 18(4):383-388, April 1970. 22 refs.

The average lead-210 concentration in air particulates for 1966 differed significantly between locations and ranged from 4.8 to 26.1 fCi/cu m, while the concentration in total diet was not significantly different between locations and averaged 0.80 pCi/kg. A portion of a sample of air particulates representing approximately 200-1000 cu m of air was obtained daily from selected sampling stations by drawing air through dust filters at high velocity. Total diet samples were also obtained from selected stations. Lead-210 concentrations exhibited seasonal variations for samples collected at Springfield (Ill.), Salt Lake City, New Orleans, Los Angeles, and Winchester (Mass.), but showed no seasonal variations at Honolulu, San Juan, and Anchorage. Locations affected by air masses which have passed over ocean waters (and hence lower in radon-222) appear to have lower lead-210 concentration than inland locations. It was estimated that an average of 0.15-0.21 pCi/day of lead-210 reaches the blood stream of inhabitants of the United States, and that about 70-90% of this amount comes from iingestion. (Author abstract modified)

7991 APTIC NUMBER 19111

McGuire, Terry and Kenneth E. Noll
RELATIONSHIPS BETWEEN CONCENTRATIONS OF ATMOSPHERIC POLLUTANTS AND AVERAGING TIMES. Preprint, California State Dept. of Public Health, Berkeley; California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 19p., 1970. 6 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30-April 1, 1970.)

The relationship between maximum concentration and averaging time was studied for five different air pollutants in 17 California cities. Maximum concentrations for averaging times of one hour, one day, one month, and one year were shown to be approximately proportional to averaging time with an exponent which varies with the pollutant and the sampling location. An expression was developed for predicting maximum concentrations for various averaging times; the predicted concentrations, based on empirically-determined values for the exponent, differed from observed maximum concentrations by an average of 10%, while with theoretically-determined values of the exponent, the deviation was 38%. Empirical values of the exponent may be determined for the data from any sampling location for which there is one year's record. The equation has application in the areas of air quality criteria and standards development. The conversion of different criteria and standards to equivalent concentrations for a common time period permits direct comparison of these criteria or standards. (Author abstract modified)

7992 APTIC NUMBER 19824

Mogi, Toshijiro, Masamichi Shimizu, Nobuhiro Kondo, Kazuhide Yamazaki, and Sojiro Jinguji
EFFECTS OF DIESEL EXHAUST GAS ON THE HEALTH OF WORKERS. PART I. ENVIRONMENTAL SURVEY. (Dizerukaiki gasu ga shintai ni oyobosu eikyo. Daiippo kankyochosa). Text in Japanese. Tetsudo Rodo Kagaku (Science of Railroad Labor), no. 22:1-25, 1968. 11 refs.

Exhaust gases from diesel locomotives were investigated at locations most likely for pulmonary effects on railroad workers to be prominent, namely, in tunnels and service depot structures. The compounds to be determined were carbon dioxide, carbon monoxide, nitrogen oxides, sulfur dioxide, methane, aldehydes, and other smoke constitutents. Measurements were conducted with collection bottles, automatic continuous monitoring devices, and alkali filters, while the analyses performed were the Saltzman, P-rosaniline, and barium chloranil methods. The pertinent data on nitrogen oxides, methane, and sulfur dioxide are tabulated for diesel as well as other types of locomotives. Results show that in general the gases are low in concentration, although high instantaneously, and are not immediately harmful. There were cases, however, when the concentrations were higher than the levels causing problems in Japan and other countries. In Tsuchikura Tunnel, especially, the passage of diesel locomotives yielded substantially higher levels of nitrogen oxides.

7993 APTIC NUMBER 19630

Molodov, A. M.
VISIBILITY OBSERVATIONS MADE WITH M-53A AND M-71 INSTRUMENTS. (O nablyudeniyakh nad vidimost'yu po priboram M-53A i M-71). Text in Russian. Tr. Nauchn-Issled. Inst. Gidrometeorol. Priborostr., no. 29:46-48, 1966.

Errors detected in visibility measurements taken in January-February 1966 by the Upper Volga Hydrometeorological Service are discussed. These errors involved the following: failure to select a target at an appropriate distance, i.e., commensurate with the prevailing visibility, or within the operating limits of the instrument; failure to compensate for high sky brightness; poorly timed transition from daytime to night-time measurement techniques; recording errors; and computational errors. If these errors are avoided, daytime and

night-time visibility determinations can be made sufficiently reliable on a 10-point scale.

7994 APTIC NUMBER 19357

Newbury, R. C.
THE SARNIA SURVEY. Can. Chem. Process., 39(3):60, 62, 64, 66, and 68, March 1955. 1 ref. (Presented at the First International Congress on Air Pollution of the American Society of Mechanical Engineers, New York, March 1-2, 1955.)

In 1952, a cooperative research project involving the Research Council of Ontario and six large industries was initiated to study both air and water pollution in the Sarnia basin. Sarnia, which lies on the east bank of the St. Clair River, where its water leave Lake Huron, is a center of oil refineries and plastics, snythetic rubber, and carbon-black plants. As part of the research project, a master recording station and a mobile laboratory were built to survey dust fall and sulfur dioxide concentrations. The dust fall data collected to date indicate high summer concentrations and a spring peak where shipping and heating loads coincide. It is thought that the ships and their associated docking activities may be responsible for a dust fall of 20 tons/sq mile/month. The results of the sulfur dioxide measurements are presented in the form of polar diagrams for the fall of 1953. The diagrams clearly show the effect of wind direction and the contributions to total pollution of various sources. The meteorological data obtained indicate the influence of the river on wind direction and the occurrence of reversals in wind direction which can raise sulfur dioxide concentrations from 0.12 ppm to 1.5 ppm in a few minutes.

7995 APTIC NUMBER 21860

Ohmichi, S., H. Uno, and K. Tsuchida
COMPOSITION OF SUSPENDED PARTICULATES AND RESPIRABLE DUST BY CHEMICAL ANALYSIS. (Taiki chuu no hooyu baijin ryudo bunpoo ni kansooloo kenkyoo (3) kagakoo bunseki hoh ni yoloo hooyu baijin to respirable dust no seibuun ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):33, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The particle size distributions and chemical analyses of air-borne dust were examined. A high-volume air sampler was used to collect total air-borne dust; a cyclone-high-volume air sampler, to collect respirable dust (less than 3.3 micron in diameter) included in the total dust; and a cascade centripter, to find weight distributions of particles. Ordinary wet chemical analysis was applied for NH3(+), SO4(2)(-), NO(3)(-), Cl(-), etc. and emission spectroscopy and atomic absorption spectrophotometry were used for metallic ingredients. Samples were obtained at the Chiba seaside industrial area. The diameters of these dusts ranged from 1.9- 5.4 micron with an average of 3.9 micron in terms of 50% mass median diameter. The percentage of respirable dust over total air-borne dust varied 25-50% with an average of 37%. The amount of SO4(2)(-) in the respirable dust over that in the total dust showed 24%-9/%; the former increased as the latter increased.

7996 APTIC NUMBER 19508

Ohmichi, S. and M. Ito
THE MEASUREMENT OF HYDRO-CARBON IN ATMOSPHERE BY GAS CHROMATOGRAPH. (Gas chromatograph ni yoloo taikichu no tanka suoiso no sokootei-Sekiyu combinahto chitai ni okeloo tanka suoiso (Dai 1 poh). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):42, 1969. (Proceedings of The Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

Hydrocarbon measurements were performed at a point near a petroleum refinery, a point on a highway, and a point in a commercial and residential area in the Ichihara sea-side industrial area located along the east of Tokyo Bay, to know the present pattern of its distribution. By means of gas chromatography, 17 lower boiling hydrocarbons were separated from the C3 to C5 hydrocarbons (propane, propylene, isobutane, n-butane, cis-2-butene, n-pentane, 3-methyl-1-butene, 1.3-butadiene, 1-pentene, 2-methyl-1-butene, trans-2-pentene, cis-2-pentene, 2-methyl pentene, and n-hexane.) No significant differences in a distribution pattern of hydrocarbons at these three points were found. Only 8 hydrocarbons were found in the commercial and residential area in the night; those showed low concentrations.

7997 APTIC NUMBER 19618

Pivovarova, Z. I.
DISTRIBUTION OF TRANSPARENCY COEFFICIENT OF THE ATMOSPHERE (FOR INTEGRAL FLUX) THROUGHOUT THE TERRITORY OF THE USSR. (Raspredeleniye koeffitsienta prozrachnosti atmosphery (dlya integral'nogo potoka) po territorii SSSR). Text in Russian. Tr. Gl. Geofiz. Observ. (Moscow), no. 213:105-121, 1968. 13 refs.

Surveys of atmospheric transparency coefficients throughout the Soviet Union for the months of January, March, June, and September are reported. A map showing the attenuation of solar radiation due to aerosols, together with atmospheric turbidity, is also presented for the month of June. The transparency of the atmosphere varies considerably with longitude at constant latitude, with variation in total direct solar radiation reaching 7 kcal/sq cm at 60 degrees north, and 15-20 kcal/sq cal at 45 degrees north. Distribution of transparency coefficients was found to be affected primarily by water vapor content and also to a great extent by persistent aerosols.

7998 APTIC NUMBER 21816

Robinson, Elmer and R. C. Robbins
ATMOSPHERIC BACKGROUND CONCENTRATIONS OF CO. Preprint, New York Academy of Sciences, New York, 13p., 1970. 11 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Carbon monoxide data obtained during five voyages in different parts of the Pacific were combined to provide an average north-south CO concentration curve for the area. The concentrations ranged from a low of about 0.1 ppm in the Arctic to a high of about 0.2 ppm between 30 and 50 deg. N. Below 30 deg N, the concentrations decreased again, first to 0.10 ppm at the equator and then to 0.04 at about 50 deg S. These Pacific area data probably represents minimum background levels because of the remoteness of the region from major pollutant sources. The estimated global average based on the data is 0.1 ppm; the estimated average hemispheric concentrations are 0.14 ppm for the northern hemisphere and 0.06 ppm for the southern hemisphere. The present data and other data available on background concentrations do not indicated any significant increase in atmospheric concentrations of CO in the past 15 to 20 years. It is noted that polar tropospheric data do not differ much from surface measurements made at Point Barrow and that measured stratospheric concentrations are the lowest yet encountered. These results suggest some sort of stratospheric sink in the atmospheric CO system.

7999 APTIC NUMBER 19684

Chow, Tsaihwa J. and John L. Earl
LEAD AEROSOLS IN THE ATMOSPHERE: INCREASING CONCENTRATIONS. Science, 169(3945):577-580, Aug. 7, 1970. 19 refs. (Presented at the American Chemical Society National Meeting Symposium on Geochemical Atmospheric Constituents, Houston, Texas, Feb. 25, 1970.)

In 1968 and 1969, concentrations of lead aerosols were determined for downtown San Diego and three other sites in the San Diego area: a mountaintop observatory 47 miles west of the city, an observation pier extending 1000 ft into the Pacific and located in a residential district, and a valley station located 10 miles inland in an area of heavy traffic flow. When considered together with previously reported concentrations for the mid-Pacific, the results show that the frequency of atmospheric lead distribution increases logarithmically from the mid-ocean to remote high mountains, to seashore, suburban, and urban environments. The annual lead concentration in San Diego, where the level set by the World Health Organization has already been exceeded, is increasing by 5% per year, that in the inland valley by 15%. In contrast, concentrations at the observation pier and mountain top are relatively low. The seasonal variations at the sampling sites are noted and explained by meteorological conditions. The isotopic composition of the lead aerosol in the San Diego area is similar to that of lead aerosol in the San Diego area is similar to that lead additives isolated from gasoline. This indicates that the excess lead in the aerosols can only be attributed to automobile exhausts.

8000 APTIC NUMBER 20215

Semenov, A. D., L. I. Nemtseva, T. S. Kishkinova, and A. P. Pashanova
ORGANIC SUBSTANCES IN ATMOSPHERIC PRECIPITATES. (Ob organicheskikh veshchestvakh atmosfernykh osadkov). Text in Russian. Doklady Akad. Nauk SSSR, 173(5):1185-1187, 1967. 13 refs.

Results from determinations of the organic compound content in rain and snow samples taken throughout the USSR are presented. Tests were made for organic carbon and nitrogen, free amino acids, protein substances, amines, reducing sugars, polysaccharides, organic acids, and esters. Some samples were also tested for organic phosphorous and aldehydes. Organic carbon was found in quantities of 2.1-24 mg/liter in rain and 2.5-7.2 mg/l in snow. Organic nitrogen content measured 0.7-5.0 and 0.7-2.9 mg/l, respectively. Phosphorous content ranged 0.01-0.12 mg/l. Free amino acids were found in rain water in amounts of 9 to 50-60 mug/l, while the protein content exceeded these values by 3-4 times. Amine content in rain water was 3-35 mug/l; in snow, 2-6 mug/l. The concentration of reducing sugars ranged 230-1800 and 120-330 mug/l for rain and snow, respectively. Polysaccharide content was 80-1100 (rain) and 50-480 (snow) mug/l. Organic acid content amounted to 18-300 (rain) and 24-110 (snow) mug-equiv/l; the following were detected: acetic (predominant), butyric, valeric, and capronic. Ester content was 18-70 (rain) and 24-57 (snow) mug-equiv/l. Aldehyde content was 120-200 (snow) and 250-600 (rain) mug/l (referred to acetaldehyde). Urea was detected in amounts of 0.2-0.3 mg/l.

8001 APTIC NUMBER 21800

Shleien, Bernard, Joseph A. Cochran, and Paul J. Magno
STRONTIUM-90, STRONTIUM-89, PLUTONIUM-239, AND PLUTONIUM-238 CONCENTRATIONS IN GROUND-LEVEL AIR, 1964-1969. Environ. Sci. Technol., 4(7):598-602, July 1970. 15 refs.

Data are presented on monthly concentrations of strontium-90, strontium-89, plutonium-239, and plutonium-238 in ground-level airborne particulates collected in Wincester, Mass., from October 1963 (for radionuclides of strontium) and May 1965 (for radinonuclides of plutonium) to March 1969. The ratio of the activities of strontium-89 to strontium-90 in the samples indicates an influx of strontium-90 following all but the sixth Chinese atmospheric detonation. In 1968, approximately 60% of the strontium-90 present in ground-level air was of post-1963 origin. The ratio of the activities of plutonium-239 to strontium-90 prior to February 1968 was 0.017 plus or minus 0.009. There was a gradual increase in the above ratio later in 1968 which is attributed to debris from the sixth, seventh, and eighth Chinese tests. Levels of plutonium-238 in SNAP-9A debris in ground-level air during 1968 were 80% to 50% lower than had been predicted. (Author abstract)

8002 APTIC NUMBER 19445

Stratmann, H. and H. Irfeld
SULFA-DIOXIDE IMMISSION MEASUREMENTS IN THE REGION NORDRHEIN-WESTFALEN FROM NOVEMBER 1, 1967 TO OCTOBER 31, 1968. (SIC). Schriftenreihe Landesanstalt Immissions-und Bodennutzungsschutz Landes Nordrhein-Westfalen (Essen), no. 16: 1-7, 1969. 11 refs. Translated from German. Belov and Associates, Denver, Colo., 13p., Feb. 1969.

In large areas of North Rhine Westphalia, especially along the heavily industrialized areas of the Rhine and Ruhr Rivers, measurements were performed to determine the distribution of sulfur dioxide emissions. Measurements were made at 5280 locations in accordance with a statistical plan. Emission distributions for the entire supervised region are presented on maps. Comparisons of current values and values obtained in previous years are presented for the Ruhr Valley and selected towns and counties. The trend indicating a continuous decrease in sulfur dioxide emissions for most cities and counties of the region which was observed during previous measurement periods was not continued during the 1967-1968 period. While 23 cities and counties continued to decrease, 23 others showed increases. All cities and counties in the western and southern sections showed an increase of about 10%. The counties of Kempen-Krefeld, Rees, and Dinslaken showed increases of about 20%. The program of air quality monitoring will continue during 1969.

8003 APTIC NUMBER 21869

Tairafune, K., M. Takahashi, and A. Sato
STUDIES ON CHEMICAL CONSTITUENTS OF FREE DUST IN IWATE PREFECTURE. (Iwate-ken ni okeru fuyubaijin no kagakuteki seibun ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):3, 1969. (Proceedings of the 10th Annual Meeting of the Japan Society of Air Pollution, 1969.)

An analysis of dust particles in the atmosphere has been conducted since 1968 in Kamaishi, Miyako, Ofunato, Higashiyama-cho and Morioka in Iwate Prefecture. Except for Morioka, chosen as a control area, the other locations are mainly engaged in steel and iron production, metal refining, and cement production. The collection of dust particles and their chemical analysis were performed according to the methods used by NASN of the U. S. Public Health Service. Major items of interest were concentration by weight, pH, sulfates, nitrates, and benzene-soluble organic matters. Metallic components were analyzed by means of atomic absorption tests. In order to observe the possible effect of pollution on the local residents, hair from 1000 persons was collected and analyzed by atomic absorption tests. Large amounts of copper, manganese, lead, iron, calcium, and magnesium were extracted, indicating that dust particles do have an effect on people.

8004 APTIC NUMBER 19145

TNO, Delft (The Netherlands), Research Inst. for Public Health Engineering
ATMOSPHERIC POLLUTION. ANNUAL REPORT. p. 15-23, 1968.

Air quality measurements conducted in The Netherland in 1968 focused on the area between Rotterdam and the North Sea, the area between the Hook of Holland and The Hague, The Hague, Delft, Zuid Holland, north-eastern Gronigen, the North Sea Canal, and the Sloe area. Most of these areas are highly urbanized and characterized by concentrations of several industries. In addition to simple measurements made with deposit gauges and Liege spheres, measurements were made to determine concentrations of sulfur dioxide, hydrogen fluoride, standard smoke, and carcinogenic substances. For SO2 and smoke measurements, many stations employed a new fourfold, automatic absorption apparatus. Other new gas detection apparatus, and new analytical methods, are reviewed. In general, the measured concentrations were not alarming, but in many cases it is thought desirable to continue measurements.

8005 APTIC NUMBER 21906

Wagman, Jack
AEROSOL COMPOSITION AND COMPONENT SIZE DISTRIBUTIONS IN URBAN ATMOSPHERES. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, California Univ., Berkeley, Public Health Service, Washington, D. C., National Air Pollution Control Administration, 19p., 1970. 10 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31, and April 1, 1970.)

Data for chemical components in atmospheric aerosols were obtained by the use of cascade impactors. Of the components studies, sulfate, nitrate, chloride, ammonium, and lead were consistently found in association with sub-micron sized particles. These particles are highly respirable and include the aerosol fraction that is most effective in scattering light. Phosphate and such metals as iron, nickel, and copper are contained in larger particles. More emphasis should be placed on determining particulate compounds and not merely elements, for it is primarily as compounds that particulate matter either cause or fail to cause health or economic damage. Atmospheric aerosols have been characterized primarily by measuring their bulk properties and very rarely by studying the nature of individual particles; yet, it is as individual particles that aerosols exert their pollutant effects. (Author conclusions modified)

8006 APTIC NUMBER 21649

Wanner, H. U.
BACTERIAL CONTAMINATION OF THE AIR IN THE VICINITY OF PURIFICATION PLANTS. (Bakterielle Verunreinigung der Luft in der Umgebung von Klaeranlagen). Text in German. Z. Praeventivmed., no. 5:326-327 1967. 2 refs.

Fine aerosols laden with bacteria develop during the aeration process in sewage purification plants. Most of the bacteria die within seconds, while the survival of resistant germs depends primarily on temperature. The number of germs above the aeration tanks was measured by two methods. Air was drawn at a speed of 25 l/min through two consecutive impingers which contained 150 ml of buffered saline solution. The solution was then mixed with a plate-count agar. In the second method the air was drawn through a split-sampler onto a nutrient medium which rotated. Measurements at several purification plants 1 m above the aeration tanks revealed bacterial concentrations ranging from 1000 to 100,000 germs/cu m measured, six measurements were taken at distances of 50, 100, 200 and 400 m during various weather conditions. At the

50 and 100 m distance, 600 and 1400 germs/cu m were measured at temperatures between 1 and 15 C with average wind speeds of more than 3 m/sec. These numbers were considerably higher than those at temperatures between 23 and 28 C with wind speeds of less than 2 m/sec. The average was always between 100 and 400 germs/cu m regardless of the temperature and wind speed at a distance of 200 and 400 m.

8007 APTIC NUMBER 19168

Weyant, William S.
INTERPRETATION OF OZONE MEASUREMENTS AT U. S. ANTARCTIC STATIONS, 1964. World Health Organization, Geneva, Switzerland, Scandinavian Council for Applied Research, Copenhagen, Denmark, and International Commission for Plant Raw Materials, Proc. Symp. Polar Meteorology, Geneva, Switzerland, 1966, p. 29-36. 1 ref. (Sept. 5-9.)

In 1964, the program of ozonesonde measurements at the U. S. Antarctic stations Amundsen-Scott and Byrd was expanded to include regularly scheduled flights and Dobson ozone spectrophotometric measurements of total ozone. Monthly mean total ozone data are presented to show the annual course of atmospheric ozone at both stations; individual daily total ozone values are also given for Byrd station during the period of the spring stratospheric warming, along with stratospheric temperatures at two levels. Data from 42 sucessful ozonesondes released at Amundsen-Scott are used to prepare a time cross section of monthly mean stratospheric ozone density for the year. The Dobson data show a middle- and late-winter minimum of atmospheric ozone in the polar atmosphere and a maximum at the time of spring atmospheric warming. Daily 50-mb temperatures are closely correlated with daily total ozone amounts during the spring. It is seen from the time cross section of stratospheric ozone densities at Amundsen-Scott that the level of ozone maximum over Antarctica is very low (15-18 km), and that the height of maximum density is highest during the spring warming period. Maximum ozone concentrations appear related to a marked increase in wind speed as well as temperature at mid-stratospheric levels, with most of the observed spring increase in total ozone occurring in the 150 mb-50 mb layer. The data provide some evidence that horizontal advection may be more important than in situ vertical motions in bringing about the rapid stratospheric warming and substantial increase in total ozone observed in the spring. (Author abstract modified)

8008 APTIC NUMBER 21812

Yamate, N. and T. Matsumura
DETERMINATION OF FORMALDEHYDE IN THE ATMOSPHERE. (Taikichu no formaldehyde nohdo ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):121, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

In order to clarify the actual behavior of formaldehyde in air, a continuous measuring instrument for formaldehyde had previously been developed which used absorption spectrophotometry with acetyl acetone solution which colors on absorption. The instrument gave an average value of measurements in an hour with a full scale of 0 to 20 ppbm. The results of the measurement in 1968 at Kasoo-Higaseki pollutant measuring station in Tokyo are now presented. The number of measurements was 6740; yearly average, 0.76 ppbm; yearly maximum value, 4.8 ppbm; monthly maximum 0.90 ppbm (in July); and daily maximum, 1.96 ppbm. The frequency of concentration groups was 0.05 to 0.5 ppbm, 42.5%; 0.6 to 0.9 ppbm, 28.3%; 1 ppbm, 25.9%; 2 ppbm, 3.0%; 3 ppbm; 0.2%; and above 4 ppbm, 0.03%. For daily variation pattern, it shows a minimum at 6 am, starts to increase about 8 am, and shows a maximum around 1 pm, which continues to about 5 pm and then starts to decrease. A correlation was found between formaldehyde concentration and concentrations of carbon monoxide, sulfur dioxide, nitric oxide, nitrogen dioxide, airborne dust, and traffic volume as follows, using n as the numbers of measurement, r as the correlation coefficient, and T as the traffic volume cars/hr: (CO ppm : 399.9 HCHO ppm + 1.64, n equals 6270, r equals 0.521; SO2 ppm : 5.84 HCHO ppm + 0.035, n equals 5885, r equals 0.467; NO ppm : 5.88 HCHO ppm + 0.022, n equals 5066, r equals 0.271; NO2 ppm : 2.04 HCHO ppm + 0.019, n equals 5281, r equals 0.324; Dust mg/cu m : 19,477 HCHO ppm + 220.0, n equals 4041, r equals 0.251; and HCHO ppm : 0.0000118T-0.0068, n equals 6208, r equals 0.462.

8009 APTIC NUMBER 19295

Alkezweeny, A. J. and W. D. Green
THE EFFECT OF AIR POLLUTION ON THE CONCENTRATION OF ICE AND CONDENSATION NUCLEI. J. Rech. Atmospheriques, 4(2):31-33, Jan.-March 1970. 6 refs.

In order to evaluate the relationship between pollution levels and nuclei counts, a series of ice nuclei and cloud condensation nuclei measurements were made at eight sampling sites in Los Angeles area. A correlation existed between decreasing visibility and increasing condensation nuclei counts. Certain isolated sources of pollution can be sources of ice nuclei. However, other components in polluted air may lead to deactivation of preexisting nuclei. Tables of the results from each sampling site are included.

8010 APTIC NUMBER 19529

Altshuller, A. P., S. L. Kopczynski, W. A. Lonneman, F. D. Sutterfield, and D. L. Wilson
PHOTOCHEMICAL REACTIVITIES OF AROMATIC HYDROCARBON-NITROGEN OXIDE AND RELATED SYSTEMS. Environ. Sci. Technol., 4(1):44-49, Jan. 1970. 17 refs.

The photochemical reactivities of the two most atmospherically abundant alkylbenzenes, toluene and m-xylene, were determined. Data were obtained on hydrocarbon consumption; nitrogen dioxide formation; yields of formaldehyde, oxidant, and peroxyacetyl nitrate; and eye irritation response. Some addition measurements were made on other alkylbenzenes and alkylbenzene-n-butane-nitrogen oxide systems. The carbon and nitrogen balances were computed and, as in previous work, were less than satisfactory. Dosages in ppm per hr for nitrogen dioxide, oxidant, and peroxyacetyl nitrate were computed. These dosages, along with intensity of eye irritation response, are discussed in terms of the effects of reducing hydrocarbon and nitrogen oxide levels and changing hydrocarbon composition. Reducing nitrogen oxide concentration reduced nitrogen dioxide dosage and usually also yielded modest reductions in eye irritation response. Conversely, reducing nitrogen oxide concentrations over a wide range increased the oxidant dosages or changed them only slightly. Control of olefins and alkylbenzenes effectively reduces ozone and peroxyacetyl nitrate levels and decreases eye irritation response. Investigators concerned with reducing the adverse effects of photochemical air pollution should give additional attention to preferential control of olefins and alkylbenzenes. (Author abstract modified).

8011 APTIC NUMBER 19050

American Society of Mechanical Engineers, New York, Pollution Standards Committee
RECOMMENDED GUIDE FOR THE CONTROL OF DUST EMISSION - COMBUSTION FOR INDIRECT HEAT EXCHANGERS. ASME Standard APS-1, 17p., 1968. 7 refs.

Various factors relating to the dispersion of dust particles emitted by indirect heat exchangers are discussed. The concentration of suspended dust in the ambient air is determined by the mass rate of dust emission, by the manner of discharge, and by subsequent dispersion. Meteorological dispersion equations are available to predict the concentration of suspended dust. Maximum concentration at ground level will occur beneath the axis of a smoke plume during unstable or neutral temperature conditions, and only at a critical wind speed that is usually moderate or high. When numerous sources are involved, the highest ground level concentrations will occur with low wind speeds and stable temperature conditions. Two methods of determining the maximum concentration at ground level are discussed in detail. The maximum collection efficiency with a high efficiency mechanical collector is 85-90%. With an electrostatic precipitator, efficiency can be as high as 99.9%. Smoke density can be determined by comparing the apparent density of smoke as it issues from a stack with a Ringelmann chart located 50 feet from the observer.

8012 APTIC NUMBER 21801

Barnhardt, A. E. and J. L. Streete
A METHOD FOR PREDICTING ATMOSPHERIC AEROSOL SCATTERING COEFFICIENTS IN THE INFRARED. Appl. Opt., 9(6):1337-1344, June 1970. 20 refs.

A method is presented for predicting scattering coefficients in the atmospheric windows from 1.0 to 15.0 micron. The method avoids the assumption that the index of refraction and the aerosol distribution are constants over the range of relative humidity values. Relative humidity is taken as the independent variable with the aerosol distribution and index of refraction dependent on the value of the relative humidity. A two-component continental and maritime aerosol distribution is used. Although strictly applicable to the 1.0-15.0 micron wavelength region, the calculations are extended with a lesser degree of accuracy into the visible region so that comparisons with measured data may be made. (Author abstract modified)

8013 APTIC NUMBER 19187

Berlyand, M. E., O. I. Furenbin, and I. M. Zrajevsky
THEORY OF TRACER DISTRIBUTION NEAR THE GROUND. J. Geophys. Res., 75(18):3657-3664, June 20, 1970. 15 refs.

The peculiarities of tracer distribution in ground-layer air were investigated on the basis of the solution of the differential equation of turbulent diffusion. The use of numerical methods of solution and an electronic computer made it possible to calculate the concentration field from elevated sources under natural conditions of changes of horizontal and vertical wind velocity components and exchange coefficients. The use of both light and heavy pollutants as tracers is considered. Possibilities of using tracers under anomalous meteorological conditions when increased concentrations (elevated inversions, calms, etc.) can be created in the ground-layer air are also

examined. The relationship between pollutant concentration from the source, both in the presence and in the absence of wind, is analyzed. The velocity field of air currents over rough terrain is studied theoretically by integration of the equation of motion. Air currents over some kinds of relief (hills and hollows) are investigated. For these problems, turbulent exchange is taken into consideration and potential currents near various forms of underlying surface are used for more schematic calculations. The field of vertical and horizontal velocity and turbulence is also determined on models with the help of wind-tunnel experiments. Characteristic forms of cross terrain and city buildings of old and new types are modeled. (Author abstract modified)

8014 APTIC NUMBER 19326

Blokker, P. C.
THE ATMOSPHERIC CHEMISTRY AND LONG-RANGE DRIFT OF SULPHUR DIOXIDE. J. Inst. Petrol., 56(548):71-79, March 1970. 25 refs. (Presented at the Institute of Petroleum Special Meeting, London, England, Oct. 21, 1969.)

The present state of knowledge of the atmospheric chemistry of sulfur dioxide and its abundance and long-range drift in Western Europe are reviewed. Global sources of sulfur, in the form of sulfur dioxide or hydrogen sulfide, are natural biological decay and unnatural pollution sources. Atmospheric H_2S can be normally or photochemically oxidized, either after absorption on a particle or when dissolved in cloud or rain water. In a polluted atmosphere, SO_2 can be oxidized rapidly to form sulfuric acid aerosol by photochemical processes, or by catalytic oxidation by metal ions, ammonia, or alkaline salts. SO_2 can also be absorbed by plants or washed-out by precipitation. Global circulation patterns of sulfuric compounds are given. In the last decade there has been considerable increase in sulfate concentrations in rain water in Europe. Studies of rain water pH indicate a considerable increase in acidity in all countries except Great Britain.

8015 APTIC NUMBER 21815

Briggs, Gary A.
PREDICTION OF PLUME RISE HEIGHTS. Vanderbilt Univ., Nashville, Tenn., School of Engineering, Tennessee Stream Pollution Control Board, and Tennessee Dept. of Public Health, Proc. Conf. Environ. Water Resources Eng., 8th Ann., Nashville, Tenn., 1969, p. 229-242. 25 refs. (June 5-6.)

A state-of-the-art survey of the literature on plume rise and extensive comparisons between formulas and observations showed a wide discrepancy between most existing plume rise formulas, including those for buoyant plumes. The best results were obtained with formulas derived from a fairly simple mathematical model. These formulas, which are summarized here, gave consistently good results when compared with plume rise observed in a variety of meteorological conditions. Unlike many other formulas, they are based on the following important variables influencing plume rise: wind speed at plume level, the distance downwind of the stack, the height of the source, and the variation of ambient temperature with height. The formulas apply specifically to rise near the stack and through elevated inversions, stable, and neutral air.

8016 APTIC NUMBER 19080

Brock, J. R.
DYNAMICAL THEORIES OF KNUDSEN AEROSOLS. (FINAL REPORT). Texas Univ., Austin, Dept. of Chemical Engineering, PHS Grant AP 00479, 83p., June 15, 1969. 57 refs.

In atmospheric pollution by aerosols or particulate matter, the particles in the sub-micron range are by far the most numerous and constitute perhaps the greatest potential health and economic hazard. Such sub-micron particles in the atmosphere are termed Knudsen aerosols inasmuch as their dynamic behavior, i.e., generation, growth, and transport, is characterized by a non-dimensional parameter termed the Knudsen number, Kn. This number is defined usually as the ratio of the mean free path of the molecules of the suspending gas to the effective radius of a particle. Ordinary laws of continuous fluid dynamics do not apply to Knudsen aerosols. Any dynamical process must be described through knowledge of the molecular velocity distribution function of the suspending gas molecules. To this end, a description is given under the following categories for transfer processes to aerosol particles: charge transfer; mass transfer; radiometer forces (momentum transfer) consisting of thermophoresis and photothermophoresis; diffusional forces consisting of diffusiophoresis and photodiffusiophoresis; energy transfer; non-stationary transfer processes; and quasi-stationary assumptions. A qualitative and semi-quantitative description of the transfer processes to single Knudsen aerosols in the transition region is provided in terms of appropriate fundamental coefficients such as accommodation coefficients, molecular constants, and transport properties of the particles themselves.

8017 APTIC NUMBER 21646

Budyko, M. I.
RADIATION FACTORS OF CONTEMPORARY CLIMATE CHANGES. Radiotsionnye faktory sovremennykh izmenenii klimata). Izv. Akad. Nauk SSSR, Ser. Geogr., no. 5:36-42, 1968. 7 refs. Translated from Russian. Belov and Associates, Denver, Colo., 12p., April 18, 1970.

Data are presented on the variations of air temperature for zones from 17 to 19 deg north lat and of solar radiation reaching the earth, over approximately the last 100 years, from 1880-1885. A rise in temperatures which began at the end of the 19th century halted about 1940 and changed to a decrease, with larger changes in the middle and especially the high latitudes. The radiation curve shows two maxima, one at the end of the last century and a second, more prolonged peak during the 30's; a decrease began in the 1940's. These variations are related to changes in atmospheric transparency, as when sharp decreases in solar radiation occur after explosive volcanic eruptions fill the lower layers of the atmosphere with volcanic dust; average earth temperatures may decrease several tenths of a degree. With settling of the dust,

radiation and temperatures increase. The radiation decrease beginning in the 1940's may be due in part to similar effects on atmospheric transparency from industrial pollution and nuclear weapons testing. If the present large quantities of atmospheric dust are of volcanic origin, temperatures may be expected to rise if no new major eruptions occur; if a significant portion is from human economic activity, the decrease in temperatures may be of long duration. The need for worldwide data on volcanic eruptions, dust, atmospheric regimes and solar radiation is stressed.

8018 APTIC NUMBER 17739

Byzova, N. L.
TURBULENT DIFFUSION OF A SETTLING IMPURITY FROM A POINT SOURCE SITUATED IN THE LOWER LAYER OF THE ATMOSPHERE. (O turbulentnoy diffuzii osedayushchey primesi ot tochechnogo istochnika, raspolozhennogo v nizhnem sloye atmosfery). Text in Russian. In: A Study of the Boundary Layer of the atmosphere from a 300-meter Meteorological Tower. Moscow, Akad. Nauk SSSR, 1963, p. 109-118. 10 refs.

Aerosols ejected from a test tower at the Institute of Applied Physics and having a fall rate of 0.03-0.3 m/sec in still air were studied. Ground-level measurements of impurity precipitation were analyzed in connection with accepted diffusion equations. Source height varied from 25 to 265 m; wind speed, from 1.5 to 10 m/sec; and settling rate, from 0.03 to 0.3 m/sec.

8019 APTIC NUMBER 21755

Carson, J. E.
CHICAGO AIR POLLUTION SYSTEM MODEL EXPERIMENTAL STUDIES. In: Radiological Physics Division Annual Report July 1968 Through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 130-133, 1969. 9 refs.
CPSTI: ANL-7615

Four experimental programs have been initiated to obtain certain meteorological measurements in Chicago and to measure dispersion rates over the uneven terrain of the city. The projects are necessary for a proper understanding of urban air flow patterns and for the development of a numerical model to predict air pollution levels. A helicopter sounding program is being utilized to evaluate vertical and horizontal variations of temperature, humidity, and altitudes of maximum sulfur dioxide concentrations. For continuous observations at heights well above the surface, aspirated temperature sensors have been installed on two television towers and a water tower. The accuracy of building sensor data will be tested by having the instrumented helicopter fly at the height of the sensor but away from the building heat. The other programs involve fuel switch tests and sulfur hexafluoride tracer studies. Troubles have been encountered in the SF6 detector system, but preliminary results show that background levels of this gas, at least near Argonne, are alarmingly high.

8020 APTIC NUMBER 21767

Carson, J. E. and D. M. Nelson
CHICAGO AIRCRAFT SOUNDING PROGRAM. In: Radiological Physics Division Annual Report July 1968 through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 135-142, 1969. 3 refs.
CPSTI: ANL-7615

Chicago has instituted a helicopter and balloon program to obtain the types of meteorological measurements necessary for accurate estimations of diffusion conditions over the city. The helicopter system provides sulfur dioxide soundings and measurements of vertical temperature gradients; the balloons, equipped with radiosondes, provide wind and temperature data from the surface to 10,000 ft and, in addition, give wind information in the zone of transport over the city. About 15 flights were made during the period of this report; features of several of the more interesting flights are presented, together with vertical SO2 and temperature profiles for the days in question. Special attention is called to the fact that pollutants were contained in and not ahead of a fresh polar air mass behind an east-west stationary front. Other data presented demonstrate the importance of the mixing layer concept and show that a weak inversion aloft can act as a lid to dispersion and vertical mixing. Further data pertain to the space and time variability of the adiabatic lapse rate.

8021 APTIC NUMBER 21945

Carson, James E. and Harry Moses
PLUME RISE FORMULAS. J. Air Pollution Control Assoc., 20(7):476-477, July 1970. 6 refs.

Discrepancies between plume rise calculations, based on the same formula, for two T.V.A. power plants are noted and tentatively attributed to different definitions of the term 'plume rise' or to the manner in which plume rise was determined from a centerline height versus distance plot. Data on observed versus calculated values are presented to show that the equation does not produce a consistent pattern of underestimation, even though it somewhat underestimates plume rise from large plants. In general, the formula appears to result in smaller deviations between observed and calculated values than the Bosanquet 1957 formula.

8022 APTIC NUMBER 19567

Charlson, R. J., P. F. Pueschel, and N. C. Ahlquist
USE OF THE INTEGRATING NEPHELOMETER FOR STUDYING DELIQUESCENT AEROSOLS. Washington Univ., Seattle, Water and Air Resources Div., 6p., 1969 (?). 10 refs.

Preliminary studies are reported which deal with light scattering as a means for studying the sudden phase change occurring when an aerosol composed of a salt in air is converted into solution droplets at humidities below saturation. Among the advantages of using an integrating nephelometer to investigate these deliquescent properties of atmospheric aerosols is the in situ nature of the

measurements. Theoretical aspects are reviewed, while the apparatus and method used in air pollution and visibility studies are described. Atmospheric aerosols in an urban location and on a sea coast, as well as a laboratory-produced sodium chloride aerosol, were investigated with the instrument system. A unique characteristic of a city aerosol may be the drastic increase in its light scattering behavior at humidities approaching 100%, although smaller increases in light scattering are shown at humidities of 70 and 85%. This behavior suggests that most of the particles are non-hygroscopic and/or that the water soluble fraction of individual particles is small, as might be expected after a coagulation process of aerosols with various chemical natures. Possible future applications of optical studies of deliquescent phenomenon are noted.

8023 APTIC NUMBER 17719

Chiaki, Toshio
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 44. ANALYSIS OF TURBULENT BOUNDARY LAYER (II). Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 2p.

In the turbulent boundary layer, the vertical distribution of the wind speed is represented by the logarithmic and linear type law. The thickness of the boundary layer is 30 m to approximately 300 m, and is connected with the atmospheric stability. It is thickest in the neutral atmosphere and thin in the stable and unstable atmosphere. The turbulance intensity of the atmosphere in the boundary layer becomes larger as the layer approaches the ground. The vertical distribution roughly conforms to the logarithmic law. The value of the turbulence intensity is affected by the atmospheric stability. The ratio of the turbulence intensity for 1 minute to the average wind speed exceeded 0.10 in the unstable atmosphere. The atmospheric diffusion coefficient, obtained from this ratio, showed a tendency to be proportional to the square of the surface wind speed.

8024 APTIC NUMBER 21891

Cole, Alan L. and Lars F. Olsson
MESOSCALE WIND SYSTEMS AROUND THE GREAT LAKES. (FINAL REPORT). Michigan Univ., Ann Arbor, Dept. of Meteorology and Oceanography, NAPCA Grants AP-00380-01, 02, 03, Proj. OPA 08650, 60p., July 1969. 23 refs.

An extensive observational study of the lake and land breeze climatology near the eastern shore of Lake Michigan is described. Surface winds, temperatures, humidities, pressure, and solar radiation were continuously measured at several stations for more than four years. During periods of high lake breeze frequency, intensified studies of winds, temperatures, and humidities aloft and over the lake have augmented the climatological data. Case studies of well-developed lake breeze circulations have been published in technical papers and reports. The field study program and the collected observational data are summarized. An inventory of the status and availability of the data are given in several tables. A short description of findings made on the basis of this field program is supplemented by abstracts of scientific papers based fully or partly on data pertinent to this study. (Author abstract)

8025 APTIC NUMBER 19181

Drozdova, V. M. and F. P. Pakhon'ko
CONTENT OF TRACE ELEMENTS IN PRECIPITATION. J. Geophys. Res., 75(18):3610-3612, June 20, 1970. 12 refs.

Seventy-five combined monthly precipitation samples collected in 1968-1969 at stations in the north, northwest, and central regions of USSR were analyzed. Annual averaged maximum and minimum concentrations of manganese, nickel, lead, and iron in precipitation are given, as well as mean concentrations of the same elements during cold and warm periods for regions of the European territory of the USSR. A proposed spectroscopic technique simplifies the determination of trace elements in precipitation samples of not more than 100 ml. (Author abstract modified)

8026 APTIC NUMBER 12431

Environmental Science Service Administration, Silver Spring, Md. Research Labs.
ATMOSPHERIC TRANSPORT AND DIFFUSION IN THE PLANETARY BOUNDARY LAYER. ESSA-ARL 3, 81p., Dec. 1967. 21 refs.

The study of atmospheric transport and diffusion in the planetary boundary layer, micrometerology, diffusion climatology, and the application of this work to the disposal of radioactive waste gases to the atmosphere are reported. The following items are discussed: low altitude constant volume balloon (tetroon) trajectories; natural radioactivity (radon) diffusion studies; atmospheric transport and diffusion at coastal sites; and boundary layer turbulence. Research is reported under the following headings: FBR-II (reactor) diffusion studies; deposition and effluent cloud depletion studies; radar-tetroon-transponder system; meso-micro studies; technical support to reactor projects; and computer programs. Computer programs include wind direction persistence program; precipitation duration and probability program; dye analysis program; linear least squares fitting and partial correlation program; analysis of concentration fields and display of isolines on printer; auto- and cross-correlation computations; and power spectra computations.

8027 APTIC NUMBER 19183

Fabian, P. and Chr. E. Junge
GLOBAL RATE OF OZONE DESTRUCTION AT THE EARTH'S SURFACE. Arch. Meterol. Geophys. Bioklimatol. Ser. A. (Vienna), vol. 19:161-172, 1970. 11 refs.

Model calculations were performed to estimate the vertical ozone transport in the lower troposphere due to turbulence as a function

of horizontal wind velocity and surface roughness. Using measured values of the ozone destruction rates, the ozone sink strength for various surface types within different latitude belts were calculated. The global ozone sink is likely to range between 4.0 and 7.1 times 10 to the 8th power tons/year, which is in good agreement with previous estimates by different methods. It is possible that because of the ocean spray layer above the water surface, the ozone destruction rate will increase considerably. The possibility of this is being investigated. (Author abstract modified)

8028 APTIC NUMBER 21796

Francis, Chester W., Gordon Chesters, and Larry A. Haskin
DETERMINATION OF PB(210) MEAN RESIDENCE TIME IN THE ATMOSPHERE. Environ. Sci. Technol., 4(7):586-589, July 1970. 9 refs.

Rainwater was filtered through an 0.22-micron Millipore filter and the resultant dust and filtrate fractions analyzed for polonium-210 by alpha-particle counting with a semiconductor detector. Growth curves for Po-210 and Pb-210 were obtained by counting several filtered rain samples at different times. Approximately one-half of the Pb-210 in freshly fallen rain was in the dust fractions. In contrast, only 2-3% of the Pb-210 in freshly fallen rain was in dust fractions, suggesting that the mechanism for its transfer from rain to dust is more complicated than simple adsorption. The Po-210 and Pb-210 in dust fractions were already in radioactive equilibrium at the time of the rainfall, indicating that the Pb-210 was not recently scavenged from the troposphere. The lack of radioactive equilibrium between Po-210 and Pb-210 in the filtrate fractions suggested that both components originated in, and were somehow scavenged from, the atmosphere. Thus only filtrate fractions should be used for estimating the mean residence time of Pb-210 in the atmosphere. From the filtrate ratios of the two components, the mean residence time of Pb-210 was estimated to be 9.6 days, plus or minus 20%.

8029 APTIC NUMBER 21853

Frenzel, Carroll W.
THE LOW-LEVEL WIND FIELD AT PHOENIX AND TUCSON. Arizona Univ., Tucson, Inst. of Atmospheric Physics, Scientific Rept. 17, 45p., Oct. 2, 1961. 3 refs.

Resultant surface winds presented as monthly averages for each hour of the day for two years have been computed for Tucson and Phoenix and are displayed as hodographs showing the diurnal variation of the surface wind. The most persistent feature of the wind field at both of these stations is the drainage wind which occurs during the early morning hours. During the warmer portions of the day, air motion tends to be toward higher elevations. Mean air motion for each month is presented. Considerable difference between months is noted. High frequencies of reported calms at Phoenix for several months lead to rather small net air movement. The diurnal variation in the number of reported calms is related to the diurnal reversal in wind direction associated with the mountain-valley circulation. The relationship of these resultant winds to the air pollution problem at these two cities is discussed.

8030 APTIC NUMBER 21837

Frenzel, Carroll W.
THE WIND REGIMES AT TUCSON AND PHOENIX AND THEIR RELATION TO AIR POLLUTION. J. Ariz. Acad. Sci., 2(3):98-103, Feb. 1963. 8 refs.

Air motion and the diurnal variation of this motion at Tucson and Phoenix are described. The wind flow in relation to air pollution is discussed. Both theory and observations are presented, and many of the main features of theory are substantiated by observations. The most persistent feature of the wind regime is the drainage wind which flows toward lower elevations at times when the lowest layers of the atmosphere are cooling. This thermal structure, in addition to producing a characteristic motion, also retards vertical mixing and, therefore, leads to higher concentrations of pollution in the lowest layers. Low net air motion over a 24-hour period is more typical of the winter months and this, in conjunction with a relatively stable thermal structure, makes the cool season potentially the most crucial from the pollution standpoint. (Author summary modified)

8031 APTIC NUMBER 19129

Fritschen, Leo J., Charles H. Driver, Charles Avery, John Buffo, Robert Edmonds, and Russell Kinerson
DISPERSION OF AIR TRACERS INTO AND WITHIN A FORESTED AREA: 1. Washington Univ., Seattle, Coll. of Forest Resources, ECOM Contract DA-AMC-28-043-68-GB, Proj. 1T0-61102-B53A, Task 17, Rept. ECOM-68-G9-1, 51p., Sept. 1969. 12 refs.
CFSTI, DDC: AD 700974

An investigation was conducted to determine the general features of mass and momentum transfer at a forest border interface and simultaneously to study the dispersion of small particulate material into and within a forest canopy from a clear cut area in relation to meteorological conditions. Experimental methods included consideration of the following: experimental sites, sampling grid, vegetation cover, species composition, tree size, basal area, canopy description and model, air temperature, wind speed, wind direction, and particle sampling. Tabulated test data, analyses, summary, and interpretation are published in volumes II and III.

8032 APTIC NUMBER 21748

Gatz, D. F. and E. W. Klappenbach
CITY OF CHICAGO POLLUTION INCIDENTS: CASE STUDIES. In: Radiological Physics Division Annual Report July 1968 Through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 148-159, 1969. (Presented at the Air Pollution Control Association Annual Meeting, New York, June 24, 1969.) 3 refs.

CFSTI: ANL-7615

Chicago weather phenomena and sulfur dioxide pollution sources interact in a number of different ways to produce episodes of severe pollution. To obtain data for a SO2 prediction model, three high pollution cases involving different meteorological events were examined in detail with the aid of a surface weather map for the day; time sections of SO2 concentrations and wind at selected stations; and meso-scale charts of winds, temperatures, and SO2 concentrations of the city. The first case was evidently a heat-island transfer. Winds converged over the axis of the city heat island from northwest and northeast on a clear, cold, nearly calm winter afternoon. Evidence was obtained of a recirculation of once-polluted air back into the city. In contrast to theory, the strength of the circulation decreased with increasing city-rural temperature differences. The two remaining cases involved winds off Lake Michigan. One was a lake breeze, with the land warmer than the lake surface. The other involved a shift to east winds over the whole region in response to a pressure gradient reorientation. In this case, the lake surface was warmer than the land. In both cases, observed pollution patterns were consistent with theoretical expectations. However, nocturnal inversion trapping and morning inversion breakup fumigation may also have occurred in one of the cases, thus demonstrating the complexity of the meteorological cause for any given pollution episode.

8033 APTIC NUMBER 21718

Gatz, D. F.
PROJECT ITREX-A COOPERATIVE THUNDERSTORM TRACER EXPERIMENT. In: Radiological Physics Division Annual Report July 1968 through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 142-143, 1969. 2 refs.

The Illinois Tracer Experiment (ITREX) is a cooperative study to learn more about the mechanisms and efficiencies of aerosol scavenging by rain. Three research groups are participating in the study, which utilizes both natural and artificial tracers. Five experiments are planned in a 40-mile-square rain gauge network near Champaign, Illinois. In the first, indium will be released during a thunderstorm. Total deposition of the tracer by the storm will be calculated and divided by the known amount released to obtain the removal efficiency. The second experiment has similar objectives, but in addition will compare the removal rates of indium, lithium, and silver. The third experiment will examine the circulation patterns of soluble and insoluble particles, condensation nuclei, ice nuclei and oxygen and hydrogen isotopes in rainwater. Using gaseous SG6, the fourth experiment will trace thunderstorm downdrafts from their theoretical mid-level origin to ground level. The fifth experiment will study the removal efficiency of the naturally available aerosols.

8034 APTIC NUMBER 19074

Hansen, James E. and James B. Pollack
NEAR INFRARED LIGHT SCATTERING BY TERRESTRIAL CLOUDS. National Aeronautics and Space Administration, New York, Goddard Inst. for Space Studies and Cornell Univ., Ithaca, N. Y., Lab. for Planetary Studies, 60p., 1970. 30 refs.
CFSTI: N70-20854

Calculations of the reflectivity of water clouds (liquid and ice particles) are compared to observations of terrestrial clouds in the near infrared. New Mie scattering calculations of general interest are presented. A revision in the optical constants of ice for a wavelength about 3 micron is suggested. Several methods which reduce the work load in multiple scattering computations are detailed. It is possible to use the spectral variation of the reflectivity to derive the size of the cloud particles and their phase (liquid or solid) as well as the total optical depth of the clouds. Typical results show that dense cirrus clouds have an optical depth of greater than 10 and are composed of ice particles of mean radius 15-20 micron; the cumulus clouds which were analyzed showed a more variable, but usually smaller, particle size. In spectral regions were the single scattering albedo is high most of the gas absorption takes place within the clouds rather than above them. (Author abstract modified)

8035 APTIC NUMBER 19694

Herron, John T. and Robert E. Huie
REACTIONS OF O2 (1) DELTA G WITH OLEFINS AND THEIR SIGNIFICANCE IN AIR POLLUTION. Environ. Sci. Technol., 4(8):685-686, Aug. 1970. 15 refs.

The relative importance of photochemical air pollution of the reactions of olefins and other unsaturated organic compounds with atomic oxygen or molecular oxygen in its lowest-lying excited state is assessed in terms of recent experimental data on rate constants. It is concluded that reactions of excited molecular oxygen are less important than the corresponding atomic oxygen reactions. Rate constants for some reactions of O(3)P and O2-1/delta g are presented tabularly. (Author abstract modified)

8036 APTIC NUMBER 17721

Hino, Mikio
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 46. COMPARISON OF NUMERICAL VALUE EXPERIMENTS AND WIND-TUNNEL EXPERIMENTS IN ATMOSPHERIC DIFFUSION. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 3p.

The results of a numerical analysis method to determine the diffusion of smoke at an actual location are compared with the results of wind-tunnel experiments. In the numerical analysis, the objective area is divided into small squares to form a lattice. The height of the mountain at each lattice point is read off from the map in a computer. The distribution of the upper layer wind under the influence of the ground configuration can thus be calculated. Taking the upper layer wind distribution as one of the boundary conditions, the wind distribution in the ground layer is found from the boundary layer equation in hydrodynamics. The

diffusion of smoke is obtained from Fick's diffusion equation. In a wind tunnel experiment, only the smoke concentration corresponding to the collection in a short time is available. In a numerical experiment, the smoke concentration of an arbitrary collection time can be readily obtained. The area within 15 km from the smoke source was taken as the object of study. The results of the numerical and wind-tunnel experiments showed good agreement in the wind direction distribution and in the concentration distribution.

8037 APTIC NUMBER 19503

Honma, H. and M. Suzuki
HEIGHT OF PLUME FROM STACK OF LARGE THERMAL POWER STATION. (Daiyolyo kalyokoo natsoodenjo entotsoc kala no haien johshoh takasa). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):95, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

The comparison among formulas for height of plume rise, which have been published but give considerable differences, was based on measured values of plumes from thermal power plants. A modified Bosanquet-II equation was recommended earlier which uses 0.26 U(1/2) as a plume expansion coefficient instead of 0.13 suggested by Bosanquet. Within the wind velocity of 1- 10 m/sec, this modified Bosanquet-II equation agrees with the measured values and Lucas's, Moore and Spurr's and Thomas's equations show comparatively good agreements above 6 m/sec. Priestly's and Holland's equations give fairly lower values. These measurements are taken where the heat emission rates of plume sources lie between 45 and 17 times 10 to the 6th power cal/sec (150 and 600 MW), in daytime, and under approximately neutral condition of the atmosphere. It is necessary to consider in more detail the height-of-rise in the case of the very weak wind. The measurement of the height of rise are done by both photos (which are analyzed graphically,) and the measurement of the vertical distribution of sulfur dioxide concentration in a plume by a helicopter.

8038 APTIC NUMBER 17725

Honma, Tadao
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 50. ANALYTICAL METHOD FOR THE DEGREE OF WIDESPREAD AIR POLLUTION AND COUNTERMEASURES AGAINST SUCH POLLUTION. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 8p.

Countermeasures against sulfur dioxide pollution using the standard of (polluted area) times (average concentration) are discussed. A new analytical method was proposed, and countermeasures were studied, based on the examples of calculation. Several equations are presented which give the degrees of linear and areal pollution from a given smoke source. Assuming that these degrees are the reasonable quantities of the pollution affecting the district concerned, practical nomographs were prepared. The degrees of linear and areal pollution were calculated after the amount of fuel consumption in industrial cities had been divided into large scale, medium scale, and small scale groups. The height of the chimneys, the sulfur content, and the number of smoke sources were also properly chosen. The degrees of pollution affecting the whole district, or the midtown area and the residential area, for each scale were given. Sulfur dioxide can be reduced by using low sulfur oil in small scale factories, and high sulfur oils in large scale factories. Increasing the height of the chimneys of medium scale factories is also of importance in lowering pollution. The extent of the effect of power plants on the ground surface SO2 concentration 20 km from the midtown area was less than 10%.

8039 APTIC NUMBER 17730

Horiuchi Kazuya, Tooru Fujii, and Machiro Yasukawa
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 59. A STUDY OF THE ENVIRONMENTAL POLLUTION CAUSED BY A HUGE GENERATING SOURCE. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution) 2(1):70-77, 1967. Translated from Japanese. 2p.

The diffusion state of sulfur dioxide emitted by the chimneys of a steam power plant was investigated. The SO2 concentration measuring points were set up to the north and the southeast of the plant, taken as the origin; each point was positioned on concentric circles of 2, 6, 8, 10, and 12 km. Continuous measurement was conducted at one hour intervals. The wind direction and speed on the ground were observed by a Koshin-vane. To obtain meteorological data in the upper air, the temperature and wind speed were observed up to 500 m above the ground by means of a captive balloon. Photographs were taken from airplanes to determine the height of the rising smoke. The results of the 1954, 1965, and 1966 investigations showed that the SO2 concentration tends to increase each year with an increase in the consumption of heavy oil.

8040 APTIC NUMBER 21735

Horvath, H.
A COMPARISON OF NATURAL AND URBAN AEROSOL DISTRIBUTION MEASURED WITH THE AEROSOL SPECTROMETER. Environ. Sci. Technol., 1(8):651-655, Aug. 1967. 6 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 8th, Oakland, Calif., 1967.)

Air samples were collected with the Goetz aerosol spectrometer both in Vienna and in the nearby mountains. By counting the deposited particles in the microscope, the size frequency of the aerosol was determined. Due to the resolution power of the microscope, the size range measured was limited to particles larger than 0.27 micron in diameter. The size frequency curve has in general the same shape both in town and in the mountains, whereas the total particle number varies widely--5000 particles per cc downtown, fewer than 800 particles per cc in residential area, and fewer than 300 particles per cc in natural aerosols. Normally, the particle number decreases during rainfall and increases in fair weather, while the mode of particle size increases slightly during rainfall and decreases during fair weather, especially in haze. The smallest particles occur in combustion aerosols. Investigations on the metastability of the

aerosol particles showed that the urban aerosol is less stable than the natural aerosol. (Author abstract)

8041 APTIC NUMBER 17724

Imai, Kazuhiko, Michio Fadeta, and Tadaaki Owada
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 49. STATISTICS ON THE CLASSIFICATION OF ATMOSPHERIC STABILITY. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 2p.

The classification of atmospheric stability by wind direction is discussed. The classification conforms with the classification table of atmospheric stability according to the English Law, except that the column for actual cloudiness in the daytime was not used, and at night the classification was made only by the wind speed. It was statistically found, in contrast to the conventional statistical values, that D type (neutral) is less frequent, and night type (light wind, extreme stability) is very common. In application to the analysis of atomic power installation obstructions, the fact that some stabilities are more frequent affects the estimated values of the annual concentration distribution.

8042 APTIC NUMBER 21868

Inoue, Kentaro
RELATIONSHIP BETWEEN SULFUR DIOXIDE CONCENTRATION AND METEOROLOGICAL CONDITION IN MIZUSHIMA INDUSTRIAL DISTRICT. REPORT 1. RELATIONSHIP AMONG SULFUR DIOXIDE CONCENTRATION AND WIND DIRECTION, WIND VELOCITY AND ATMOSPHERIC STABILITY. (Mizushima rintai kogyo chitai no okeru taiki osen to kisho joken ni tsuite. (Dai 1 ho): Aryusan gasu no nodo to fuko, fusoku, taiki anteido tono kankei). Text in Japanese. Okayama Tgakkai Zasshi (J. Okayama Md. Soc.), 81(3,4):127-134, April 30, 1969. 11 refs.

The amount of crude petroleum in the Mizushima Industrial District has been increasing since 1965 following the establishment of petroleum combine, accompanied by air pollution due to sulfur dioxide gas. The concentration of SO2 and frequency of high SO2 concentration (greater than 0.2 ppm) were measured by the use of an electro conductivity autorecorder with a frequency of one hour. Direction and velocity of the wind were measured by an Aerobeu at the same point of SO2 measurement. The amount of sunlight was measured by Robitzsch sunometer. The pollutant (mainly SO2) was transported to the northern part of Mizushima Industrial District by S(south), SSW(south-southwest) and WSW (west-southwest) winds (mainly sea breezes). Direction and velocity of the winds which brought higher concentrations of SO2 to Fukuda-cho, Minami-Kasuga-cho, and Amagi districts were S, SW and SSW winds with the velocity of 3 to 4 m/sec. In Mizushima Harbour Office, a high concentration of SO2 was observed in S, SW winds of 2 to 3 m/sec velocity, or SW wind of 2 to 5 m/sec velocity. Average SO2 concentration was higher in S, SW winds of 2 to 4 m/sec in Fukuda-cho, Minami-Kasuga-cho and higher in SSW wind of 6 m/sec, SSW 6 to 7 m/sec, SW 2 to 5 m/sec, and S 3 m/sec in Mizushima Harbour Office. An unstable sea breeze brought higher concentration of SO2 to Fukuda-cho, while a more stable sea breeze did the same to Amagi district. According to calculations by Pasquill's chart, the diffusion in C-stability brought higher concentrations of SO2 to Fukuda-cho, while the diffusion in D-stability did the same to Amagi district.

8043 APTIC NUMBER 17722

Inoue, Mikita, Satoshi Nakajima, and Yasushi Ogawa
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 47. ANALYSIS OF THE DOWN-DRAFT BY MEANS OF WIND-TUNNEL EXPERIMENTS. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 3p.

Turbulence intensity in the case of average wind speeds of 0.5, 1.0, 1.5, and 2.0 m/s at several places leeward of the turbulence lattice was measured. A miniature-type low velocity diffusion wind-tunnel was used. The results were analyzed with respect to mode of decay of the turbulence intensity, self-correlation coefficient, and spectrum distribution. The mechanism of the down-draft in a simple building model was also investigated on the basis of these data. The chief items that were analyzed included the distribution of the average wind speed on the lee of a building and photographic analysis of the types of smoke.

8044 APTIC NUMBER 21713

Israel, H., M. Norbert, and C. de La Riva
MEASUREMENTS OF THE THORON CONCENTRATION OF THE LOWER ATMOSPHERE IN RELATION TO THE EXCHANGE IN THIS REGION. (FINAL TECHNICAL REPORT). Technische Hochschule, Aachen (West Germany), Forschungsstelle fuer Geophysik und Meteorologie, Contract DAJA 37-68-C-0967, 173p., Aug. 1969. 29 refs.
CFSTI, DDC: AD 698034

Atmospheric eddy mass transfer was traced by means of measuring the vertical concentration profile of thoron exuded from the soil under known conditions. Eddy momentum transfer and eddy heat transfer were studied. Mathematical formulations of eddy viscosity and eddy diffusivity were derived. A theoretical justification is given for the confinement of the measurements to the use of the emanations as tracers for the atmospheric eddy transport. A system of measuring and evaluating eddy diffusivity was developed. To obtain a satisfactory degree of measurement accuracy for the evaluation of eddy conductivity, it was necessary to develop new measurement systems. The development of the new equipment, now undergoing testing, is presented.

8045 APTIC NUMBER 21736

Jarman, R. T. and C. N. de Turville
THE VISIBILITY AND LENGTH OF CHIMNEY PLUMES. Atmos. Environ., vol. 3:257-280, 1969. 27 refs.

Nonhebel's (1960) theoretical analysis of chimney smoke visibility is extended to incorporate the scattering of sunlight and skylight by plume particles. Relationships are derived theoretically which show how both the visible length and the smoke contrast depend on the particles in the plume and the weather conditions. The theory treats inert particles which do not change by chemical reactions in the atmosphere or coagulation, etc. It is also limited to low particle concentrations where multiple scattering effects may be ignored. The accuracy of the calculation of the visibility and length of plumes from commercial power stations is limited because the optical properties of the smoke particles are not known accurately. Using approximations for the optical properties of the complex smoke particles, given by the Mie theory for uniform spheres, there was reasonable agreement between the observed and calculated plume lengths and contrasts. It is known that in stable atmospheric conditions, some plumes occasionally remain visible for some miles downwind of the chimney. These persistent plumes are discussed briefly and simple criteria for their occurrence are derived. (Author abstract)

8046 APTIC NUMBER 19528

Johnston, Harold S.
PHOTOCHEMICAL OXIDATION OF HYDROCARBONS. Ind. Eng. Chem., 48(9):1488-1491, Sept. 1956. 13 refs.

The photochemical oxidation of hydrocarbons is analyzed with respect to the production of free radicals. Considerations include light absorption, reaction rates, and possible mechanisms. Order-of-magnitude calculations are performed to obtain estimates of steady-state partial pressures and half-lives for various degrees of sunlight absorption. It is concluded that the free radicals themselves are important primary irritants in smog.

8047 APTIC NUMBER 19042

Johnstone, H. F. and D. P. Coughanowr
ABSORPTION OF SULFUR DIOXIDE FROM AIR. Ind. Eng. Chem., 50(8):1169-1172, Aug. 1958. 21 refs. (Presented at the American Chemical Society 132nd Meeting, Symposium on Air Pollution, New York, Sept. 1957.)

The rate of sulfur dioxide oxidation in drops of catalyst solutions suspended in air was studied and compared with the rate of SO2 absorption and oxidation by drops containing hydrogen peroxide. The rate of formation of sulfuric acid in a drop of catalyst solution suspended in air containing SO2 depends on the partial pressure of SO2 and the nature and concentration of the catalyst. As the concentration of sulfuric acid in an acid droplet increases with the inverse cube of the diameter as the droplet evaporates in air of low humidity, and the initial fog droplets are one or two orders of magnitude larger than the droplets formed by the photochemical oxidation, the residual acid droplets formed by the catalytic reaction in fog are probably larger than those formed by photochemical oxidation.

8048 APTIC NUMBER 21648

Jones, M. E.
A REVIEW OF THE LITERATURE ON THE STRUCTURE OF WIND TURBULENCE, WITH SPECIAL REGARD TO ITS EFFECT ON BUILDINGS. Building Sci., vol. 3:41-50, 1968. 58 refs.

With the introduction of new forms of construction and greater use of taller buildings, the designer needs to take more account of the effect of turbulence on the wind loading of structural components and on the human environment in the vicinity of buildings; improvements in the weather tightness of buildings, their natural ventilation and air pollution above buildings are also indicated. Theoretical aspects and available methods and equipment for measuring and recording turbulence in the field are outlined. Information adduced from the literature suggests that a study of the structure of turbulence in urban areas should be made initially in large open spaces within a city, well away from building wakes; velocity profiles and wind structure data obtained in such areas, will be representative of the turbulent air streams which develop over a city. Subsequent measurements nearer the buildings will indicate the influence of the buildings on their immediate surroundings, and so the interaction between the turbulent airstream and buildings in urban areas may be more closely defined for simulation in a wind tunnel. An appendix is included giving a detailed discussion of hot-wire anemometry, a method for measuring wind velocity.

8049 APTIC NUMBER 21976

Junge, C. E.
SULFUR IN THE ATMOSPHERE. J. Geophys. Res., 65(1):227-237, Jan. 1960. 13 refs.

In unpolluted areas, sulfur occurs primarily in three compounds, sulfate in aerosols and sulfur dioxide and hydrogen sulfide as gas. Sources of SO4 are the ocean, the soil, and the oxidation of the gaseous compounds. A considerable fraction of the SO2 is of anthropogenic origin. As measurements in polluted and unpolluted areas indicate, most of the H2S seems to be natural. In unpolluted air in the northeastern part of the United States, both gases have approximately equal concentrations. The chemistry of the conversion of these gases to SO4 is discussed. Estimates of the sulfur budget of the global atmosphere, excluding the SO4 in sea salt particles, indicate that 30% is of anthropogenic origin. Measurements of the chemical composition of Greenland ice back to the year 1915 are presented. The concentration of SO4 is much higher than that of other soluble constituents, but it has not increased since 1915 as much as one would expect if it were of industrial origin. It is concluded that industrial sulfur is removed from the atmosphere before it spreads to polar regions. This is consistent with estimates of the residence time of about 5 days for SO2 and about 40 days for total sulfur. More SO2 enters the oceans with river water than can be accounted for by the weathering of rocks and sediments on land and that the excess must come from the atmosphere. Assuming a closed sulfur cycle, this sulfur must return to the atmosphere as H2S produced in the shelf areas of the oceans. In

view of the considerable amounts of industrial sulfur, it is possible that the global sulfur cycle is not closed and that most of the excess sulfur in river waters is of anthropogenic origin and will stay in the ocean. (Author abstract modified)

8050 APTIC NUMBER 21791

Katz, Morris
PHOTOCHEMICAL REACTIONS OF ATMOSPHERIC POLLUTANTS. Can. J. Chem. Eng., vol. 48:3-11, Feb. 1970. 44 refs. (Presented at the Canadian Chemical Engineering Conference, 19th Edmonton, Alberta, Oct. 19-22, 1969.)

Photochemical reactions of atmospheric pollutants are described. The most important primary photochemical process is the dissociation of nitrogen dioxide into nitric and atomic oxygen. Activation energy for most atmospheric reactions may be supplied by absorption of ultraviolet and visible light by molecules and atoms that act as absorbers. The formation of free radicals from the photodissociation of aldehydes and other compounds which absorb solar radiation represents an important step in the series of reactions that lead to the production of eye irritation, plant damage, and photochemical smog. The meteorological and chemical circumstances which lead to photochemical smog are explained. Quantum yields from the photooxidation of sulfur dioxide are discussed, and an experimental method is described. The effect of humidity, nitrogen dioxide, light intensity, and unsaturated hydrocarbons are included. The roles of sulfuric acid aerosols, singlet oxygen, and ozone are analyzed.

8051 APTIC NUMBER 19351

Keffer, James F.
THE PHYSICAL NATURE OF THE SUBSONIC JET IN A CROSS-STREAM. National Aeronautics and Space Administration, Langley Station, Va., Langley Research Center, Symp. Anal. Jet Subsonic Crosswind, Hampton, Va., 1969, p. 19-36. 17 refs. (Sept. 9-10.)
CFSTI: NASA SP-218

A round jet of fluid discharging from an infinite plane into an ambient, miscible fluid of the same density which has a non-zero cross-stream component of velocity is examined. Significant parameters are the velocity ratio, defined as the exit jet velocity divided by the constant and uniform cross-stream velocity, and the angle of injection. It is convenient to think of the jet as arbitrarily separated into three regions: the source flow, where the effect of orifice geometry, plate and/or tunnel boundary layer and potential core may be important; the curvilinear zone, where the jet flow is fully developed from the standpoint of the turbulence structure and the entrainment mechanisms proceed in a relatively straightforward manner; the far region, where the jet flow, having approached its asymptotic state, is almost entirely dissipated and, on a mean flow basis, indistinguishable from the main stream. Structure of the mean and turbulent motion is discussed with reference to the various entrainment processes. By employing a suitable drag coefficient, a model equation appears to predict the trajectories of both buoyant and non-buoyant plumes reasonably well, but this concept is not attractive on physical grounds, since in regions away from the source, the processes involved in jet entrainment are most likely to result from free stream effects not depending upon pressure gradients. Work on turbulent swirling jets has verified that a marked increase in entrainment results when swirl is added to a simple jet flow, the spread rate increasing by a factor of two for a swirl velocity of the same order initially as the axial velocity. Results show that the flow is roughly self-similar in the zone of curvature, enabling some simplification to be made in the analysis of the problem.

8052 APTIC NUMBER 19277

Lablans, W. N.
MUST THE INCREASING EMISSION OF CARBON DIOXIDE BE CONSIDERED AS POLLUTION OF THE ATMOSPHERE? (Moet de toenemende emissie van Kooldioxide als een verontreiniging van de atmosfeer worden beschouwd?). Text in Dutch. Chem. Weekblad, 66(16):26-29, April 1970. 10 refs.

Emission of gases and finely divided solids into the atmosphere results not only in pollution of the air in the vicinity of the source, but also in small changes of the composition of the entire atmosphere. While carbon dioxide does not direct damage, the increase of the CO2 content of the atmosphere from 290 ppm in 1880 to 320 ppm in 1955 ascribed to conversion of fossil carbon into CO2 by man must nonetheless be classified as pollution since, by influencing the energy balance of the atmosphere, it may cause a deterioration of climatic conditions. The effect of CO2 produced by man on the mean air temperature near the ground can be determined in two steps. First, as has been done in 1959, the resulting increase of the CO2 content of the atmosphere is calculated using the value (4 days) of the mean dwell time of CO2 in the atmosphere determined from studies of CO2 exchange between atmosphere and both sea water and soil made with the aid of C(14) as tracer element. Then, the resulting mean air temperature near the ground is determined from the fact that CO2 present in the atmosphere lets the arriving solar radiation pass freely through it, but absorbs and re-emits some known wavelengths of infrared radiation emitted by the Earth. The temperature rise due to an increase of the CO2 content from 300 to 600 ppm was calculated by various authors as 1.2 and up to 6 C; 1.5 C is the value accepted at present. The discrepancies are ascribed to the strong effect of H2O-vapor content of the atmosphere on the infrared absorption, variously allowed for by the authors. At present, the variations of intensity of solar radiation arriving at the Earth and, perhaps, the concentration of solid suspensions in the atmosphere are considered important factors, besides the CO2 and H2O-vapor contents affecting the mean temperature. More numerous and more detailed world-wide pertinent meteorological data are to be obtained by the 'Global Atmospheric Research Project' and the 'World Weather Watch' of the World Meteorological Organization.

8053 APTIC NUMBER 20149

Landsberg, H.
CLIMATOLOGY AND ITS PART IN POLLUTION. Am. Meteorol. Soc.

Monographs, 1(8):7-8, Nov. 1951

Air pollution has a pronounced effect on urban climates, generally increasing rainfall, causing more fogs, and weakening solar radiation, particularly by depleting ultraviolet rays. Although rain has the desirable property of precipitating soot and inert dusts out of the atmosphere, it also washes out pollution products which are water soluble or acidic, making the rain water quite corrosive and causing extensive damage. Larger climatic effects of pollution are unproven but remain possible. Atmospheric wind turbulence and temperature lapse rate have a major influence on the accumulation or dissipation of pollution products; some of these effects and relationships are briefly outlined. Park areas seem to act as relatively effective dust filters; even in heavily polluted areas, consistently lower values of pollution are found to the lee of park lands.

8054 APTIC NUMBER 21658

Leighton, Philip A.
GENERAL DISCUSSION. In: Photochemistry of Air Pollution. New York, Academic Press, 1961, Chapt. 10, p. 254-278.

The photochemistry of mixtures of low concentrations of nitrogen oxides and hydrocarbons is discussed. The most extensive investigation of these mixtures was made in a glass-lined chamber equipped with measurement equipment. Results of this experiment are analyzed. Pollutant concentrations show quite erratic short-term fluctuations, and the same is true of solar radiation. By taking averages over a number of days, the variations will cancel out, and true diurnal variations become apparent. The reasons for these variations are discussed. The two major physiological effects of photochemical smog are eye irritation and plant damage. Three specific eye irritants have been identified. They are formaldehyde, acrolein, and PAN. Three classes of phytotoxicants are ozone, which produces a mottling or bleaching of the upper surface of plant leaves, and two others, which produce a glazing or bronzing of the under surfaces of plant leaves, identified by the age or type of leaves affected. Rates and equations of the reactions are included.

8055 APTIC NUMBER 21764

Ludwig, F. L. and Elmer Robinson
CONDENSATION NUCLEI AND AEROSOL POPULATIONS RELATED TO FOG FORMATION. (FINAL REPORT). Stanford Research Inst., Menlo Park, Calif., Contract DAHC04-67-C-0059, SRI Proj. PSU-6676, Rept. 7257.4-FR, 100p., Dec. 1969. 37 refs.
CFSTI, DDC: AD 700137

To determine the properties of the ambient atmospheric aerosol and the changes in these properties during the formation and dissipation of fog and stratus, a program of aerosol and cloud droplet measurements in stratus clouds was carried out during the summers of 1968 and 1969 in the hills south of San Francisco. Particle and droplet size distributions were determined with a Royco light-scattering particle counter, a condensation nuclei counter, and a settling tunnel; two 6-stage cascade impactors were used to collect samples for sulfur, chloride, nitrate, and volatile carbon compound analysis. Size distribution data showed a pronounced mode in the submicron size range; and in fog, secondary modes occurred at radii of about 4 to 6 micron. Theory predicted secondary modes in about the same radius interval at which they were observed, but on the average the observed concentrations are considerably smaller than predicted. The size at which the mode occurs does not show a systematic increase with time in the period just after the advent of the fog. Theory indicates that for a given combination of nuclei population and cooling rate, there is some nucleus size above which the droplets grow quite large and below which they grow only slightly; the fact that a minimum was observed tends to support this. Minimum amounts of sulfur, chloride, and nitrate compounds were associated with droplets of about 2 micron radius, while greater amounts of material were found generally in the droplets of submicron radius. Chlorides showed the smallest variations with size and the sulfur compounds the largest. Ratios of the amounts of sulfur compound materials and of nitrate materials to the chlorides were considerably greater than would be expected if the source of these materials were unaltered sea spray. The dissolved concentrations of the chlorides, nitrates, and sulfur compounds in the droplets were higher than had been calculated from theory for chlorides alone. (Author summary modified)

8056 APTIC NUMBER 21946

Macey, H. H.
PLUME RISE FORMULAS. J. Air Pollution Control Assoc., 20(7):476, July 1970. 3 refs.

A new formula for calculating plume rise from single chimneys is considered to be an improvement over those which introduce a term containing the function of the height of the chimney, while retaining the quarter-power of heat output. However, plume rises calculated by the new formula are definitely small at most wind speeds and too large at very large wind speeds and high plume rises. Moreover, at a wind speed of 6.1 m/sec, plume rises calculated by the formula are about one-half or two-thirds of those calculated by the Bosanquet 1957 formula. The implication of this difference for the design height of stacks is noted.

8057 APTIC NUMBER 21988

McCormick, P. A.
AIR POLLUTION IN THE LOCALITY OF BUILDINGS. Preprint, Royal Society of England, London, 19p., 1970. 31 refs. (Presented at the Royal Society Discussion Meeting of Architectural Aerodynamics, London, England, Feb. 26-27, 1970.)

Concentrations of air pollutants at any point in a city are due to contributions from a) the background level of the inflowing 'rural' air, b) the 'over-all' urban pollution, and, c) the sources 'local' to the point in question. The influence of buildings on the over-all pollution levels is effected through the heat island phenomenon and the geometry and temporal variation of the mixing layer into which the contaminants are dispersing.

The enhancement of downwind dispersion of pollutants from local sources upwind is appreciated, but more studies are needed to quantify all factors involved. Wind tunnel investigations have been demonstrated to be valuable in providing quantitative estimates of the distribution of gas concentrations in the flow field around a building complex. Both primary and secondary pollutants are considered. Among them are oxides of nitrogen and sulfur, carbon monoxide, hydrocarbons, and particulates. (Author abstract modified)

8058 APTIC NUMBER 19098

McDaniel, Willard T.
DOES A NATURAL MODEL FOR PREDICTING HIGH CONCENTRATIONS OF AIR POLLUTANTS ACTUALLY EXIST? American Meteorological Society, Boston, Mass., Proc. Statist. Meteorol. Conf., 1st., Hartford, Conn., 1968, p. 173-179. 18 refs. (May 27-29.)

A 1967 study in the five-state region including Texas, New Mexico, Oklahoma, Arkansas, and Louisiana examined the criteria used in the national model for predicting meteorological conditions leading to high concentrations of air pollutants and obtained a measure of how useful this model is for this region. The forecast criteria were as follows: (1) surface winds less than 8 kt; (2) winds at all levels below 500 mb less than 25 kt; (3) sinking of the air mass below 600 mb, and (4) prevalence of these conditions for at least 36 hours. As a first step in the analysis, the air quality data from 22 sampling stations scattered throughout the five-state region were examined. The second step was an examination of the Weather Bureau Daily Weather Maps. Step three was an examination of the radiosonde data for Amarillo, Fort Worth, San Antonio, Midland, and Lake Charles. In 56% of the high pollution incidents, surface winds were in excess of the prescribed value of 8 kt. Also, the winds-aloft criteria could not be applied without significant modification. In fact, each of the forecast criteria was found inappropriate for the five-state region. It appears that a regional model must be developed which will consider the meteorological factors indigenous to this climatic region.

8059 APTIC NUMBER 19011

Mead, Jaylee T.
THE CONTRIBUTION OF ATMOSPHERIC AEROSOLS TO THE MARTIAN OPPOSITION EFFECT. Preprint, National Aeronautics and Space Administration, Greenbelt, Md., Lab. for Space Physics, NASA TM X-63815, 36p., Jan. 1970. 14 refs.
CFSTI: N70-18763

The Mie theory is used to compute the integrated scattering intensities for submicron aerosol particles with various indices of refraction and several size distributions in an effort to determine if the presence of atmospheric aerosols can account for the Martian opposition effect. This non-linear surge in brightness, as the planet approaches a phase angle of 0 deg, is much more pronounced in the ultraviolet than in the infrared. Neither substances having a refractive index N between 1.20 and 1.50, which include ice, water, and solid carbon dioxide, nor highly absorbing materials, such as limonite, can produce the opposition effect. Aerosols having N greater than 1.50 with little or no absorption, such as meteoric particles or suspended surface dust composed of semi-transparent minerals, do exhibit a definite increase in reflectivity at small phase angles. By introducing an assumed surface function, which is added to the contribution by aerosols with N equal to 1.75, a model is obtained which compares reasonably well with the observations. A similar fit was obtained for N equal to 1.55 and could probably be obtained for any real index between 1.55 and 1.75. This range includes most semi-transparent minerals, thus making them good candidates for producing the opposition effect. The presence of a small amount of atmospheric aerosols, with the proper index of refraction, can provide the observed increased opposition effect for Mars in the ultraviolet, where the albedo is very low, but at the same time make a negligible contribution in the infrared, where the surface albedo is high. (Author abstract modified)

8060 APTIC NUMBER 21986

Meetham, A. R.
NATURAL REMOVAL OF POLLUTION FROM THE ATMOSPHERE. Quart. J. Roy. Meteorol. Soc. (London), 76(330):359-371, Oct. 1950. 8 refs.

Observations of atmospheric pollution throughout Britain are considered in relation to the amounts of pollution emitted through the combustion of coal. The estimated weight of ash emitted into the air and the estimate, from deposit gauges, of the ash deposited, are considered likely to agree fairly well at a figure of over one million tons/year. On the assumption that about 1.5 million tons of smoke are blown to sea each year, about 1.1 million tons of sulfur dioxide are blown to sea each year; the remaining 0.8 million tons of smoke and 1.9 million tons of sulfur dioxide must be deposited in Britain, irrespective of the quantities measured in deposit gauges. The average life of a smoke particle before deposition on land is probably of the order of 1-2 days; that of a molecule of sulfur dioxide is estimated with rather more certainty to be less than 12 hours. Of the chlorides collected in deposit gauges more than half, as a rule, come from the sea, and less than half from the utilization of coal; but the ratio must vary with the position of the deposit gauge relative to the sea and to industries. (Author abstract)

8061 APTIC NUMBER 21793

Meszaros, P.
SEASONAL AND DIURNAL VARIATIONS OF THE SIZE DISTRIBUTION OF ATMOSPHERIC SULFATE PARTICLES. Tellus (Uppsala), 22(2):235-238, 1970. 7 refs.

Data on the size distribution of sulfate particles were obtained that show an unambiguous seasonal variation that is caused by changes of the relative humidity of air. However, the sulfate mass concentration is independent of seasons and time of day, and dispersion of the size distribution is always constant. No diurnal variations in size distribution were found during the sampling period because the relative humidity was smaller than the value necessary for the phase transition of the particles. The

measured growth of the particles with increasing humidity is nearly comparable with the theoretical growth of pure ammonium sulfate particles having an 0.14-micron dry radius. The results suggest that chemical oxidation, rather than photochemical oxidation, is the cause of the formation of sulfate particles.

8062 APTIC NUMBER 19911

Miller, A. and D. Ahrens
OZONE WITHIN AND BELOW THE WEST COAST TEMPERATURE INVERSION.
Tellus (Uppsala), 22(3):328-340, 1970. 17 refs.

The oxidant concentration in the air over the San Francisco Bay Area and the Pacific Ocean was measured up to an altitude of 2500 m and the observed distribution in the vertical and horizontal was related to the characteristics and behavior of the west coast temperature inversion. Vertical time sections at fixed points and vertical cross section were constructed of oxidant concentration, temperature, humidity and winds measured from aircraft and radar. The oxidant concentration in polluted air is strongly dependent on the destruction rate, while the mean destruction rate within the surface layer depends directly on the intensity of eddy mixing and inversely on the square of the depth of the vertical mixing. Thus, the existence of a temperature inversion does not necessarily lead to a high concentration of oxidants, since the destruction rate may be high in a shallow mixing layer. The highest oxidant concentration was observed almost invariably at the edges of the west coast marine inversion, where pollutants are available for ozone production and the mixing layer is deep. Explanations are offered for the maxima of ozone that often occur above the inversion base. Distribution patterns of oxidants clearly depict the waving of the inversion layer. (Author abstract modified)

8063 APTIC NUMBER 17323

Ministry of Health and Welfare, Tokyo, (Japan), Public Nuisance Section
A REAL SURVEY PROGRAM FOR DEVELOPMENT AND CONSOLIDATION OF 1967. (Showa 42 nendo kaihatsu seibi chiiki to chosa keikaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(6):376-377, June 15, 1967.

A survey will study the atmospheric dispersion of pollutants by tracer techniques, to gather meteorological data, and to obtain sulfur containing gas measurements with high-volume air samplers and tape air samplers. Fluorescent particles (FP) were used in the dispersion tests, with FP generators installed on chimneys from 60 to 120 m in height. The particles were collected by rods distributed at 92 points and forming 90 deg angles. The collecting points were located at intervals of 10 km diameter and measurement points were interspersed at 6 deg intervals. Sequential development of the dispersing FP's were observed by a dram impacter arranged at 2 and 4 km points. The meteorological observations will be conducted by specialists in close contact with the National Meteorological Observation Center and the National Hygienics Laboratory. The project is also aided by the Ministry of Industry and International Trade. The areas to be surveyed are noted.

8064 APTIC NUMBER 17727

Ninowa, Toshio
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 52. AIR POLLUTION BY SULFUR OXIDES AND WEATHER IN THE YOKOHAMA-KAWASAKI DISTRICT.
Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 4p.

The relationship between air pollution by sulfur oxides and meteorological conditions, using data obtained from 9 measuring areas in the Yokohama-Kawasaki district, is discussed. The difference in the concentration due to wind direction is very recognizable, indicating that at any measuring station, the maximum concentration appears in the wind direction. The effects of wind speed and atmospheric stability become manifest as the averaging internals in time and space are expanded. When the daily average in time and the average concentration on the ground surface covering the Yokohama-Kawasaki district were considered, the wind speed and atmospheric stability in winter were in very good correlation with the pollution concentration. This indicates that low wind velocity and high stability heighten pollution concentration over a wide area. Other meteorological conditions, such as atmospheric pressure and front syster, were investigated with regard to the days of high pollution concentration.

8065 APTIC NUMBER 19578

Morton, B. R.
ON SIMILARITY AND THE OUTER BOUNDARY CONDITIONS FOR FLOW IN PLUMES.
Tellus (Uppsala), 20(2):367-369, 1968. 4 refs.

The relationship between similarity flow in turbulent jets and plumes and the outer radial boundary conditions is discussed. Provided it is effectively unconstricted by boundaries, the flow of a jet or plume is free to develop slowly along its axis under a balance system of forces. In such an asymptoptic region, both turbulent and mean parts of the flow are likely to settle into similarity form in which the changing structure can be represented fully by gradually varying the scales of velocity, temperature, and radius. Axial momentum flux is conserved in a jet, but increases in a plume because of the work done by conserved buoyancy. In both cases, there is a slow lateral diffusion communicating longitudinal momentum to ambient fluids which then move forward to become the core fluid. An inner similarity flow is possible as long as the outer flow is able to feed the entrainment requirements of the core. Rigid outer walls need not restrict the possibility of a similarity structure for jets and plumes if they are sufficiently far from the core. If they are too close, similarity flow will be possible only when the walls form part of the similarity geometry. Only plumes rising in conically bounded regions with a spread angle a little larger than that of an unrestricted plume will have a central core of upflow surrounded by an annular downflow.

8066

APTIC NUMBER 21756

Moses, Harry, J. R. Anderson, and D. F. Gatz
THE TABULATION TECHNIQUE FOR FORECASTING CONCENTRATIONS OF URBAN AIR POLLUTANTS. In: Radiological Physics Division Annual Report July 1968 Through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 167-179, 1969. 1 ref.

One way of demonstrating the relationship between meteorological variables and pollutants is to arrange combinations of relevant meteorological variables in an ordered sequence and present the associated probability distribution for each entry. For each combination of variables, a cumulative percentile distribution of the concentrations of a selected pollutant, e.g., sulfur dioxide, is presented. Also included are relevant statistical parameters such as the interquartile range, the mean, or the number of times. The important variables for which forecasts are required are wind direction, wind speed, ceiling height, and temperature; the fifth important variable recommended for the construction of a 'Tabulation Prediction Scheme' is hour of day. A format for recording the forecasts and the computed and observed pollution concentrations is shown. The technique, which provides for rapid prediction of pollution concentration and takes into account nonlinearities in the relationship between meteorological variables and pollution concentrations, appears to have the advantages of both source-oriented and receptor-oriented models. With modifications, it can be used to monitor the distribution of sources.

8067

APTIC NUMBER 19495

Norton, Richard B. and Charles A. Barth
THEORY OF NITRIC OXIDE IN THE EARTH'S ATMOSPHERE. J. Geophys. Res., 75(19):3903-3909, July 1, 1970. 22 refs.

The chemical reaction nitrogen(D2 state) plus oxygen (molecular) yields nitric oxide plus oxygen(atomic) can explain the observed NO density in the lower atmosphere, provided that a sufficient fraction of the atomic nitrogen is produced in the metastable D2 state. The principal reactions energetically capable of producing N(D2) in the lower thermosphere are dissociative recombination and ion-atom exchange. To obtain the best overall altitude profile of NO density, 70-85% of the nitrogen produced by dissociative recombination and only a small percentage of the nitrogen produced by the ion-atom reaction must be in the D2 state. Transport does not affect either NO or atomic nitrogen density distributions. Eddy diffusion should mix NO, but not N. (Author abstract modified)

8068

APTIC NUMBER 19505

Ogawa, Y.
THE EFFECTS OF AN OBSTACLE ON DIFFUSION. (Chikei shohgaibootsoo no kakoosan ni oychosoo eikyo ni tsooite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):102, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

Several approaches to diffusion problems around obstacles are introduced. When the effect of a plate presenting a surface of a building on the ground is examined two-dimensionally in a wind tunnel and water tank and by a small experiment in the snow field. Considering the correspondence between their Reynolds numbers as a similarity condition, a non-dimensional diffusivity coefficient based on the diffusivity coefficient for the disturbance-free flow is small and approximately constant in the cavity region, but has its peak around the boundary with the disturbance-free flow area. Simulation by a computer gives another approach, when solving difference equations obtained from non-dimensional Navier-Stokes equations. Once the flow patterns at the given Reynolds numbers are found, the diffusion can be computed through difference equations from Fick's equation, by substituting flow conditions obtained from wind tunnel experiment or from the computer. When micro weather between buildings has to be considered, the above-mentioned methods can be applied to it as the case of plates standing side by side.

8069

APTIC NUMBER 20459

Ota, Yoshio
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 43. VERTICAL STABILITY OF AIR TEMPERATURE AND AIR POLLUTION. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. 2 refs. Translated from Japanese. 4p.

From the results of temperature observations at Tokyo and Kawaguchi Tower, an explanation is offered for the vertical daily variation in the air pollution concentration for summer and winter. The concentration is small in summer, but large in winter. This may be due to radiation cooling of the air which causes the stable layer to be low. High concentration is observed at the second or the lower stable layers in winter. The lower layers have a maximum twice a day which decreases toward the upper layers; the uppermost layer has a maximum only once a day. This indicates that the stable layer is low from night to morning. The mixing of the upper and lower air becomes animated, since the lower layer near the ground shows a lapse rate of air temperature lower than that of equal density during its rise. In the afternoon, when the stable layer has risen, the air pollution concentration is small. At night it increases again due to the lowering of the stable layer. The maximum in the morning shows a time lag of 1 hour at 100 m. This suggests that the pollutant rises gradually with the stable layer. In summer, little variation occurs with the height, and no distinct maximum is seen as in winter.

8070

APTIC NUMBER 21765

Peskin, Richard L. and E. L. Krasnoff
LAWS OF DISPERSION. Rutgers - The State Univ., New Brunswick, N. J., Water Resources Research Inst., OWRR Proj. A-005-N.J., 46p., Oct. 20, 1969. 17 refs.
CFSTI: PB 188500

An example of a single-particle diffusivity computation is shown, with extension of the theory to two-particle or plume dispersion,

and an approximate analysis of the bubble dispersion problem is used to estimate the effect of the spread of bubbles from a line source. Effects of bubble size distribution and inhomogeneity in the underlying turbulence are considered. Eulerian fluid velocity evaluated in the particle position is replaced by a statistical estimated value based on the Lagrangian motion of the fluid particle taken as a reference. In the case of a Markoff process, the estimate involves the particle position, the Eulerian velocity correlation between the particle position and the position of a reference fluid particle, and the fluid particle's Lagrangian velocity. A calculation is made of the eddy diffusivity of small bubbles, and it is shown that for many practical cases, the bubbles follow the turbulent motion of fluid particles but must be corrected by a buoyancy effect. Large bubbles do not have enough time to disperse due to turbulence before surfacing, and the laminar flow existing below the diffusion source can result in a distinct bubble size segregation of those bubbles finally reaching the surface.

8071 APTIC NUMBER 21961

Peterson, James T. and Reid A. Bryson
ATMOSPHERIC AEROSOLS: INCREASED CONCENTRATIONS DURING THE LAST DECADE. Science, vol. 162:120-121, Oct. 4, 1968. 10 refs.

Atmospheric turbidity values calculated each month from solar radiation observations at Mauna Loa Observatory, Hawaii, show an increase of aerosols from 1958 through the present. These data indicate that either the effects of the Mount Agung eruption are still being observed, or a long-term trend of increasing turbidity is in evidence. Such a long period of reduced radiation after an eruption has not previously been reported. Linear regression lines fitted to the unsmoothed monthly data help to estimate the magnitude of a long-term trend. (Author abstract modified)

8072 APTIC NUMBER 19143

Peterson, James T. and L. D. Drury
REDUCED VALUES OF SOLAR RADIATION WITH OCCURRENCE OF DENSE SMOKE OVER THE CANADIAN TUNDRA. Geograph. Bull. (Can.), 9(3):269-271, 1967. 2 refs.

During an airborne reconnaissance of the southern boundary of lake ice in north-central Canada, unusually dense smoke was observed over a wide expanse of tundra. The smoke originated from a series of forest fires within the boreal forest and was carried northward in slowly expanding plumes which maintained their integrity for at least 20 miles. No buildup of smoke was noted south of the tree line, but immediately north of this line the buildup developed rapidly as a wall of smoke extending from the surface to 5000 ft. Data from pyranometer measurements of the downward total solar radiation during the flight showed that at 4000 ft, the smoke caused an average attenuation of 25% in the downward solar radiation flux.

8073 APTIC NUMBER 19184

Petrenchuk, O. P. and E. S. Selezneva
CHEMICAL COMPOSITION OF PRECIPITATION IN REGIONS OF THE SOVIET UNION. J. Geophys. Res., 75(18):3629-3634, June 20, 1970. 17 refs.

The relative importance of two mechanisms, the formation of droplets on condensation nuclei and the capture of contaminants by cloud and precipitation elements in various atmospheric layers, is evaluated. Calculations show that in the clean northern regions of the USSR, the cloud contribution constitutes 55% of the total precipitation mineralization. In the southern regions, with heavy pollution of the atmospheric boundary layer; the washout of pollutants in the subcloud layer is the predominant process. Here the cloud contribution constitutes only 20-25%. Therefore, precipitation plays a significant role in the self-cleaning of the atmosphere from admixtures of natural and artificial origin. (Author abstract)

8074 APTIC NUMBER 19079

Pitts, J. N., Jr., Ahsan U. Khan, E. Brian Smith, and Richard P. Wayne
SINGLET OXYGEN IN THE ENVIRONMENTAL SCIENCES. SINGLET MOLECULAR OXYGEN AND PHOTOCHEMICAL AIR POLLUTION. Environ. Sci. Technol., vol. 3:241-247, March 1969. 70 refs. PART I. Ibid., vol. 1:656, 1967. (Presented at the AAAS Divisional Symposium on Air Pollution, UCLA, June 1967 and the Gordon Conference on Environmental Sciences, Crystal Lake, Wash., July 1967.)

Singlet molecular oxygen may play a significant role as an oxidant in photochemical air pollution. Reaction of electronically excited oxygen with olefinic substances produces thermally unstable hydroperoxides which may be involved in the rapid conversion of nitric oxide to nitrogen dioxide, a process not well understood in photochemical air pollution. Several mechanisms for the formation of singlet molecular oxygen are examined in relation to their possible importance in the chemistry of urban atmospheres. In each, the excitation energy is derived ultimately from the sun's radiation, but the energy may be utilized by direct absorption of radiation by ground state triplet oxygen by photolysis of an atmospheric contaminant to form excited singlet molecular oxygen in the primary step, by spin-conserved energy transfer mechanism in which an atmospheric contaminant absorbs solar radiation and transfers its excitation to ground state triplet oxygen, or by exothermic chemical reaction involving atmospheric contaminants which themselves originated in a photochemical process. (Author abstract)

8075 APTIC NUMBER 19009

Pratte, Bruce D. and W. Douglas Baines
PROFILES OF THE ROUND TURBULENT JET IN A CROSS FLOW. Proc. Am. Soc. Civil Engrs., J. Hydraulics Div., 93(HY 6):53-64, Nov. 1967. 5 refs.

The flow of a turbulent jet entering normal to a crosswind is often

observed in a natural phenomena, as smoke issuing from a stack or a sewer outlet into a stream. Three distinct flow regimes can be identified in this situation. Immediately above the source is a region of flow establishment in which the intense shear between the jet and cross flow results in entrainment and acceleration of the surrounding fluid, with deceleration of the jet. This is called the potential zone. Cross and jet flows mix rapidly beyond the potential zone because the volume of fluid entrained increases with the effective jet diameter. The addition of the cross-flow momentum causes the jet to bend over, changing direction toward downstream. This is the zone of maximum deflection. In the third, or vortex zone, the two turbulent vortices are carried along at the cross flow velocity. No end has been observed for the vortex zone. By making certain theoretical assumptions, measurements of the profiles of these zones were determined experimentally. The experimental procedure is described. The curves adapted to the data can be used to define other bulk profile characteristics.

8076 APTIC NUMBER 19202

THE PHOTOCHEMISTRY OF ORGANIC SULFUR COMPOUNDS. XI. SULFUR OXIDES. Quart. Repts. Sulfur Chem., 4(4):313-314, 1969. 11 refs.

A bibliography of published books on the chemical reactions of sulfur dioxide is presented, covering the following areas: sulfur dioxide sensitized photochemical oxidation of hydrocarbons; reactions of sulfur dioxide; the photochemical reactions of phenyl azide with sulfur dioxide in various solvents; and the photochemical sulphoxidation of n-hexane. A number of relevant review books and articles are also included. The photochemistry of sulfur dioxide is of considerable importance in relation to air pollution. Reactions with hydrocarbons are a factor in smog formation. There is a need for further intensive investigations of the photochemical reactions of sulfur oxides with organic compounds.

8077 APTIC NUMBER 19603

Rosen, James M.
POSSIBLE IDENTIFICATION OF VOLCANIC DUST IN THE STRATOSPHERE. Minnesota Univ., Minneapolis, School of Physics and Astronomy, ONR Contract N00014-67-A-0113-0004, Rept. AP-28, 14p., Oct. 1969. 6 refs.
CFSTI, DDC: AD 696526

Balloon soundings of the atmospheric aerosol made at three different latitudes confirm the existence of a widespread dust layer over the Northern Hemisphere. Soundings made at Minneapolis over a period of five years show seasonal fluctuations in the total stratospheric dust by as much as a factor of four with a suggestion of a secular decrease from 1963 to 1968. Soundings made at Panama show a decrease of the dust by a factor of ten from 1966 to 1968. This rapid decrease in the amount of the equatorial dust is not inconsistent with the estimated rates of dilution and dispersion of radioactive bomb debris by horizontal and vertical eddy motion. The spectrum of particle size of the Panama aerosol is considerably flatter than that of the mid-latitude aerosol, indicating they may be of different origin. These additional equatorial particles may be the residue of volcanic material injected into the stratosphere in the Bali explosion of 1963. A more definitive measurement of the aerosol spectrum at mid-latitude shows a slope only slightly flatter than that reported by Junge in 1961 but with considerably greater concentration of particles larger than 1 micron. This could be caused by an increase in the number of large particles after the Bali event or a loss of large volatile particles counted by filter methods. (Author abstract)

8078 APTIC NUMBER 19810

Sakuraba, Shinichi
ESTIMATION OF AIR POLLUTION CONCENTRATION BY DIFFUSION FORMULAE. (Kakusanshiki ni yoru taikiosennodo no suitei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(7):396-403, July 1970.

Recent observations in Japan have indicated that the existing knowledge on diffusion process of smoke from stacks, for example, cannot be applied to air pollution problems without a considerable amount of modification. Various methods of estimating pollutant concentrations by means of diffusion formulae and the corresponding graphical analyses are reviewed. Pasquill diagrams form the basis of the analysis, but they require all types of side conditions and are considered to be applicable only to low emission sources in the flat topology with short sampling periods. The conditions are vague in that the relationship between the exact meaning of the stability classes in the diagram and the conditions themselves are not very clear. It seems that the direct method is to conduct diffusion experiments for about 30 min for different stacks heights, meteorological conditions, and topological appearances, then to obtain a set of stability classes. In coastal industrial regions, it was found that for high altitude emission sources, the stability classes are generally low. In complicated topology and even for high altitudes, the stability classes are high, for example, as has been observed in Kainan, Wakayama. In isothermal layers under the inversion interface or within the inversion layer itself where the atmosphere is quite stable, Pasquill diagrams cannot be applied and sigma z, the standard deviation of the vertical spread, becomes constant beyond a certain distance downwind from the source, and this distance also turns out to be the point of highest concentration. Since sigma z becomes constant before it becomes large, if the source is very high the ground surface pollution concentration is quite low.

8079 APTIC NUMBER 21810

Sakuraba, S., M. Moriguchi, and I. Yamaji
THE ELEVATION OF PLUME FROM A GROUND SOURCE OVER A HEATED TERRAIN. (Chihyo engen kara no hoojoh kakoosan). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):97, 1969. 1 ref. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A method is proposed to estimate the central height of concentration of a plume (z) from a ground source, when z is

influenced by leeward distance. One example of this estimation gives values of 0, 0.6, 1.5, 2.0, 3.0, and 5.0 for the leeward distance and (0), 30, 60, (60), 60, and 90 for the central height of concentration of the plume. The brackets show the measured values. In this case, Pasquill stability was D (it was E to F for diffusion from the source with 150 m tall). In a second example, 0, 0.55, 1.5, 3.0, and 5.0 are the values for the leeward distance and (0), 60, (130), 130, and 7300 are the values for the central height of concentration of the plume where Pasquill stability was C (B to C for zoom plume source).

8080 APTIC NUMBER 17731

Sakuraniwa, Shin'ichi, Minoru Moriguchi, and Isao Yamaji
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 56. ON ATMOSPHERIC DIFFUSION EXPERIMENTS WITH SMOKE SOURCES IN THE YOKOHAMA-NEGISHI DISTRICT. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 2p.

An atmospheric diffusion investigation centered about the Yokohama-Negishi district is discussed. A network of 103 measuring points were provided on the ground. At two points 2.5 km and 4.0 km leeward of the smoke source, the vertical concentration distribution was measured up to 250 m above the ground. The experiment was conducted 10 times between July 23 and July 27, 1967. Air tracer was dusted simultaneously from two heights of 90 m to 130 m and 60 m above the ground. The state of diffusion from the smoke sources at the two heights was examined as far as 8.0 m leeward. The results of these measurements and examples of the analyses are reported.

8081 APTIC NUMBER 19058

Schaefer, Vincent J.
THE INADVERTENT MODIFICATION OF THE ATMOSPHERE BY AIR POLLUTION. Bull. Am. Meteorol. Soc., 50(8):199-206, April 1969. 16 refs.

There has been a noticeable increase in air pollution over and downwind of the several large metropolitan areas of the United States. The worst accumulation of particulates occurs at the top of an inversion which intensifies at night, 1000 to 4000 feet above the ground. These particulates may modify the weather conditions of the affected area by entraining cloud droplet nuclei, so that rain does not develop. Over the past several years, rain and snow storms in some areas have consisted of small precipitation particles. When collected on plastic sheets, the precipitation consisted of badly polluted water. Auto exhaust may account for the high concentration of ice crystals observed downwind of the large cities. When iodine reacts with the lead in exhaust gases, a nucleating zone for ice crystal formation is formed. If pollution sources lead to increased dustiness from ill-used land, more cloud nuclei from burnish trash, and more ice nuclei from the lead permeated exhaust of internal combustion engines, not only will the advantage of extracting additional water from the sky be lost, but there may be a drastic change in U. S. climatological patterns.

8082 APTIC NUMBER 17726

Shoji, Hikaru, Takeo Yamamoto, Yasuo Yagi, Yoshinori Ishikawa, and Tsuneo Tsukaya
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 51. WIND-TUNNEL EXPERIMENTS CONCERNED WITH AIR POLLUTION AND DIFFUSION IN A TURBULENT BOUNDARY LAYER. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 4p.

Information on the diffusion of air pollution in a turbulent boundary was obtained using a slow velocity wind-tunnel. A flat plate covered with sand grains of 1.2 to 2.5 mm was positioned 30 cm from the floor surface of the wind-tunnel. The average wind speed, turbulent wind speed, and frequency distribution of the turbulence formed on the rough plate were measured. The self-correlation coefficient, mutual correlation coeficient, time scale of turbulence, and length scale of turbulence were calculated. The speed distribution in the boundary layer is a distribution of the logarithmic type and the turbulence is anisotropic. Ethane was released as a tracer gas with the same velocity of the average stream, and 1.5 m rearward, the concentration was measured by an infrared analyzer. The concentration distribution in the Y direction can be approximated by a normal distribution. The standard deviation is represented by an equation of the first degree of the distance from the discharge source for the change along the stream direction. The position of the maximum concentration was lower than that of the discharge source. The diffusion motion is very noticeable at the bottom of the turbulent boundary layer.

8083 APTIC NUMBER 21924

Singer, Irving A. and Constance M. Nagle
VARIABILITY OF WIND DIRECTION WITHIN THE UNITED STATES. Nucl. Safety, 11(1):34-39, Jan.-Feb. 1970. 6 refs.

Increased interest in atmospheric diffusion problems (particularly as related to the siting of nuclear power reactors) has created need for a quantitative measure of the variability of the mean wind direction with time. It has been proposed that the constancy of the wind, defined as the mean vector wind divided by the mean scalar wind be used for simple classification purposes. A trigonometric transformation is used to linearize the variation of constancy with the mean angular range of direction. This function, called the steadiness, is then computed for various time periods, and by use of extreme-value theory the recurrence intervals of various mean wind-direction ranges can be predicted. This has been done for 34 stations in the United States. Recurrence-interval maps of the steadiness of wind direction within the United States for various time periods are presented that show the interrelation of geographical location and synoptic meteorology with wind-direction persistence. The most persistent wind directions appear at coastal stations, and the least persistent occur in mountainous regions. (Author abstract modified)

8084 APTIC NUMBER 19467

Sutton, O. G.
THE THEORETICAL DISTRIBUTION OF AIRBORNE POLLUTION FROM FACTORY

CHIMNEYS. Quart. J. Roy. Meteorol. Soc. (London), vol. 73:426-436, 1947. 7 refs.

The theory of eddy diffusion from sources above ground level, e.g., factory chimneys, is developed to provide a means of making reasonably reliable estimates of the magnitude of the concentrations of pollution likely at ground level for a given height of chimney, rate of emission, and wind velocity. The earlier work of Bosanquet and Pearson is in general qualitative agreement with the more accurate expressions of the present paper, which are also in accordance with recent observations of Hewson on the distribution of sulfur dioxide in the vicinity of a large factory. Tables are given from which it is possible to estimate concentrations of pollution downward of an elevated source emitting at a known rate in various meteorological conditions. It is concluded that industrial pollution can be controlled primarily by high stacks and by some method of meteorological control. In inversion conditions a false conception of the problem may arise since, in general, such conditions will afford relief to areas in the immediate environs of the plant but will result in the maximum concentration appearing much farther afield, with a much slower fall-off of concentration with distance than in average conditions. Permanent recorders placed at fixed sites may thus be misleading, and the only safe way would appear to be a meteorological approach such as one based on the analysis of the frequency or amplitude of wind gusts. (Author summary modified)

8085 APTIC NUMBER 17295

Suzuki, Shin
CHEMICAL REACTION OF AIR POLLUTANTS, ESPECIALLY THE SECONDARY REACTIONS DUE TO PHOTOCHEMICAL REACTION. (Taiki osen no kagaku hanno, tokuni kokagaku hanno nitomonau kozokuhanno). Text in Japanese. Kagaku No Ryoiki (J. Japan Chem.), 23(9):840-850, Sept. 1969. 16 refs.

Air pollutants change into new complexes by photochemical reaction. The most famous example of photochemical smog is in Los Angeles. The early reaction stages were previously described. The importance of secondary reactions is usually determined by their generation velocity. Air pollutants of generation velocity below 1 ppm per hour have little importance, and those below 0.1 ppm are neglected. The secondary reactions are classified according to their central substances, reactions of oxygen atoms, ozone, nitrogen oxides, organic radicals, and hydrocarbons. The generation mechanisms of Los Angeles smog and London smog are considered to be photochemical reactions with nitrogen dioxide, oxygen, and hydrocarbons. London smog is produced by the photochemical or catalytic reaction with sulfur dioxide and oxygen. The distinctive features of Los Angeles smog are generation of oxidants and organic fog, eye irritation, plants damage, and carbonization of gum. The above phenomena are characteristic of ozone, aldehydes, ketones, peroxides, nitrates, and nitrites. London smog is explained by generation of sulfuric acid.

8086 APTIC NUMBER 19311

Suzuki, Shin
CHEMISTRY OF AIR POLLUTION. V- SUCCESSIVE REACTIONS OF AIR PHOTOCHEMICAL REACTION. 2. (Taiki osen no kagaku hanno. V - Taiki kokagaku hanno no kozoku hanno. 2). Text in Japanese. Kagaku Kogyo (Tokyo), 21(7):983-990, July 1, 1970.

Radicals in air react with oxygen, ozone, nitric oxide, nitrogen dioxide, olefins, and with other radicals. The reaction of R, HCO, RCO radicals with oxygen molecules is rapid, but these radicals are very rarely present in air, in contrast, HO2 and RO are present in high concentrations. Nitric oxide makes an addition reaction with radicals and removes their activity. One investigator considers the reaction to be third order, but others regard it as second order with a reaction rate equal to 6.8 times 10 to the eighth power, 1 reciprocal mole reciprocal sec (25 C). Regarding nitrogen dioxide, addition reaction and oxidation are considered. Dehydrogenation and addition reaction are with respect to hydrocarbons. Hydrocarbons in air, especially olefins, have been studied with reference to oxygen atoms, ozone, nitric oxide, and nitrogen dioxide. There is a slow reaction between nitrogen dioxide and unsaturated hydrocarbons, but no reaction between nitric oxide and unsaturated hydrocarbons. There is evidence that olefins react with dinitrogen tetroxide (0 C) to produce dinitroparaffins, nitroalcohols or nitroalkyl nitrate. Beta-nitroisobutenes or nitro-t-butylalcohol has been obtained by the reaction of isobutenes with nitric oxide or nitrogen dioxide. Nitric oxide is thought to be converted to nitrogen dioxide by diolefins present in coal gas. While the production of nitrogen dioxide from nitric oxide at night has been observed, the reaction of hydrocarbons with nitrogen dioxide in the dark is not serious. Also reported is the reaction of olefins with oxygen atoms, the products of which consist of two types of compounds: addition compounds (epoxides or carbonyl compounds), and decomposed compounds (carbon monoxide, lower hydrocarbons). The process is illustrated by the example of propylene. Data is also present on the important reactions of olefinic with ozone.

8087 APTIC NUMBER 19827

Takabayashi, Yukikazu
SOME OBSERVATIONS ON THE ATMOSPHERIC DIFFUSION FORMULAE EMPLOYED IN CANADA. (Kanada ni okeru taikikakusanshiki ni tsuite no kangae). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(7):427-433, July 1970. 21 refs.

Factors such as meteorology and topography have a large influence on the spread and diffusion of plumes. The atmospheric dilution of flue gases is generally considered to occur in two stages, the rising of the plume and its diffusion. The plume takes an arbitrary motion downwind and reaches an effective height. Then, horizontal and vertical diffusions occur with the result that the plume eventually reaches the ground level. The process of diffusion has been quite extensively studied, but not the upward motion of the plume, with which this paper is concerned. Rising of the plume depends on buoyancy, momentum, and the plume diameter,

while the plume initially shows a jet stream type behavior within the range of 0-300 meters, if the flow is fast enough. The second stage consists of the accelerated diffusion where the general outline of the plume becomes vague, the plume having lost its initial heat capacity and vertical momentum. The last stage, about 1200 meters downwind, occurs when the plume has lost its momentum and buoyancy, and the rate of upward motion becomes constant or the minimum. Different mathematical approximations for the final plume height are given. In addition, formulae for approximating the maximum ground level concentration downwind from the source are introduced for different meteorological conditions such as temperature gradient, atmospheric stability, turbulence, and the existence of inversion layers. The main point lies in the fact that based on the above formulae with appropriate correction factors, the effective heights of smokestacks can be calculated, given the emission standard and other pertinent data at the source.

8088 APTIC NUMBER 21813

Takada, M., H. Kitamura, Y. Matsushita, and S. Matsuda
FIELD EXPERIMENTS OF AUTOMOTIVE EXHAUST GAS DIFFUSION USING SULFUR HEXAFLUORIDE. (SF6 o tracer to sooloo jidohsha haishutsoo gas no kakoosan jikken). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):91, 1969. (Proceedings of the Japan Society of Air Pollution Annual Meeting, 10th, 1969.)

A preliminary experiment on diffusion of car exhaust gas is performed to determine its distribution around highways. Sulfur hexafluoride of 10 to 1000 ppm is emitted at a point in a field with almost no obstacles. Samples are collected at 2.5, 10, 20 and 40 m leeward from the emitting point with the flowrate of 2 l/min in 10 minutes. These samples are analyzed by means of gas chromatography after being concentrated through low temperature absorption method to avoid the influence of oxygen on the determination.

8089 APTIC NUMBER 17730

Takada, Nobuhiro, Hiroyuki Kitamura, and Hiroshi Umeda
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 55. DIFFUSION EXPERIMENTS BY GAS TRACER. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 8p.

An experiment using freon as a gas tracer was conducted to determine the characteristics of atmospheric diffusion of waste gases from a particular pollution source. Freon-12 was released from a 30 m chimney at a fixed rate of 100 kg/hr, and 10 measuring stations were set up on the leeward side. By observing the wind speed and direction, data on the meteorological conditions at the time of the experiment were obtained. After the collected samples had been concentrated, freon was determined by gas chromatography. The maximum concentration from the first experiment appeared about 340 m leeward of the smoke source. There was a deviation in distribution of 10 degrees in the axis as measured from the main wind direction. In the second experiment, freon was detected only at some of the measuring points. The results and calculations were compared with Bosanquet's-Pearson's equation, Sutton's equation, and the British Meteorological Bureau's equation.

8090 APTIC NUMBER 19278

Tavartkiladze, K. A.
INCREASE IN ATMOSPHERIC DUSTINESS OVER THE USSR. (Uvelicheniye zapylennosti nad territoriey SSSR). Text in Russian. Meteorol. i. Gidrol., no. 5:42-52, 1970. 20 refs.

The problem of changing atmospheric concentration of aerosol particles at a number of points in the USSR (Karadag, Tbilisi, Yerevan, Baku, Tashkent, Alma-Ata, Irkutsk, and Yakutsk) during recent decades is examined. Available data for integral solar radiation and other characteristics of the atmosphere are used to eliminate errors which frequently arise from use of the Bouguer-Beer formula. A general trend toward increasing atmospheric dust content over the entire Soviet Union is established.

8091 APTIC NUMBER 21910

Urone, Paul and William H. Schroeder
SO2 IN THE ATMOSPHERE: A WEALTH OF MONITORING DATA, BUT FEW REACTION RATE STUDIES. Environ. Sci. Technol., 3(5):436-445, May 1969. 70 refs.

Literature on atmospheric sulfur dioxide reactions is reviewed. Although the presence of sulfur dioxide in air is measured on a routine basis by many industries and municipalities, surprisingly few studies have been reported in which attempts have been made to measure the chemical reaction of sulfur dioxide in polluted atmospheres. The atmospheric matrix is highly variable in composition, degree of humidity, temperature, and angle and intensity of sunlight. Analytical techniques for measuring sulfur dioxide, sulfuric acid, and sulfate compounds leave much to be desired. From those studies that have been reported, some generalizations can be made. The reaction rate of sulfur dioxide is considerably more rapid in solutions containing metal ions (or on particulates containing heavy metal oxides) than it is in air. Ammonia helps increase the rate of reaction by neutralizing the sulfuric acid produced. The photochemical reaction rate in clean air in the presence of sunlight is quite slow. In the presence of nitrogen oxides, hydrocarbons, and ultraviolet irradiation, the rate is increased considerably. Aerosol formation is increased by the presence of SO2 in irradiated hydrocarbon-nitrogen oxide-air mixtures. However, the composition as well as the rate of formation of the aerosols seem to be highly dependent upon the types and amounts of substances present, as well as on the order of mixing. Since sulfur dioxide is constantly present in polluted atmospheres on an approximately steady-state basis, a large number of reactions of sulfur dioxide other than oxidation to sulfuric acid are possible during stagnant periods of severe temperature inversion. At such times, a mass of air can be subjected to many hours of solar irradiation and thermal catalysis. The photochemical reaction products should be especially considered for their

possible physiological importance.

8092 APTIC NUMBER 17723

Watanabe, Yuji
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 48. ON THE TURBULENT DIFFUSION OF THE WASTE GASES FROM A CHIMNEY IN A FRICTION LAYER. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 3p.

The gaseous concentration on the leeward ground due to smoke discharged from a chimney in an atmospheric turbulence is discussed. It is assumed that the vertical distribution and the vortex diffusion function in the vertical direction are represented by the powers of the height above the ground. Equations for the vertical and horizontal vortex coefficients are presented. These theoretical considerations were made by generalizing the diffusion equation in a friction layer, starting from the equation derived by Rosanquet and Pearson. The atmospheric diffusion in a friction layer should be considered when theoretically calculating the ground surface concentration. It is particularly important in the study of smoke spreading in the sky over urban areas.

8093 APTIC NUMBER 20829

Weber, Erich
CONTRIBUTION TO THE RESIDENCE TIME OF SULFUR DIOXIDE IN A POLLUTED ATMOSPHERE. J. Geophys. Res., 75(15):2909-2914, May 20, 1970. 6 refs.

Estimation of the residence time of sulfur dioxide for polluted areas is of importance for calculating the dispersion of stack effluents. From airborn measurements in the plume of a power station, the original SO2 concentration was found to decrease 50% in 20 min to 1 hr, depending on meteorological conditions. Similar results were obtained from measurements of ground-level ratios of CO2 to SO2 in Frankfurt am Main, where concentration of air pollutants, wind direction and speed, air temperature, and relative humidity have been continuously recorded for several years. Carbon dioxide is almost inert, while the proportion of SO2 can decrease by oxidation or absorption during transport through the atmosphere. In comparison with emissions, the air quality measurements in Frankfurt showed an increase ratio of CO2 to SO2. At a wind speed of 2m/ sec at 5 km to power plants or 2 to 3 km to the space heating chimneys, this represents a loss of about 50% SO2 in 20 min to 1 hr.

8094 APTIC NUMBER 21954

Westberg, Karl and Norman Cohen
THE CHEMICAL KINETICS OF PHOTOCHEMICAL SMOG AS ANALYZED BY COMPUTER. Aerospace Corp., El Segundo, Calif., Aerodynamics and Propulsion Research Lab., Rept. ATR-70(8107)-1, 23p., Dec. 30, 1969. 30 refs.
CFSTI: N70-15778

A mechanism is proposed for the formation of photochemical smog produced by the atmospheric photooxidation of trace amounts of isobutene in the presence of equally small amounts of nitrogen dioxide. Computer calculations with the chemical kinetics program show that this mechanism produces the smog chamber measurements of Schuck and Doyle. This mechanism predicts that, contrary to current beliefs, carbon monoxide may play a role in the production of ozone in polluted atmospheres. (Author abstract)

8095 APTIC NUMBER 20791

Windom, Herbert L.
CONTRIBUTION OF ATMOSPHERICALLY TRANSPORTED TRACE METALS TO SOUTH PACIFIC SEDIMENTS. Geochim. Cosmochim. Acta., 34(4):509-514, April 1970. 10 refs.

Accumulation rates of the trace metals Mn, Cu, Ni, Cr, Co, and Sr, calculated for Australian dust samples, indicate that sediment in areas of the South Pacific affected by dust falls from this source can accumulate these metals at rates similar to sediment in areas of the South Pacific where little detrital material is received. The majority of the dust was concentrated in sizes less than 15 micron. A general trend toward greater concentrations in the less than 2 micron fraction existed for copper, nickel, chromium, and possibly cobalt, suggesting that these elements are associated with the amorphous iron phases. Manganese, however, showed a greater association with the 2-5 micron size fractions. In order to determine the significance of this dust to the trace metal content of marine sediments in the South Pacific, analyses were made on cores taken from two general locations. The trace metal composition of the sediments in the Northern South Pacific reflected the high concentration of volcanic material. Both iron and manganese were considerably higher in northern South Pacific sediments than those of the western South Pacific. Copper, nickel, and cobalt also followed this trend while chromium appeased to be concentrated approximately the same way in both the same way in both the western and northern South Pacific samples. Manganese, copper, nickel, and cobalt assumulate at a faster rate with the sediments than they do with the dust. However, iron, chromium, and strontium accumulate at a faster rate in the dust then they do in the sediment. Even in the case of copper, nickel, and cobalt, the accumulation rates are not greatly different, indicating that areas affected by the dust fallout can accumulate these trace metals at rates comparable to that of marine sediments which contain little continental detrital material.

8096 APTIC NUMBER 17728

Yamada, Tsuyoshi, Hisao Hattori, Masakazu Mogi, Keiji Haijima, Nagayuki Yokoyama, Masayasu Hayashi, Koji Kitabayashi, and Kiyoshi Sugawara
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 53. INVESTIGATION OF THE METEOROLOGICAL CONDITIONS OF SMOKE DIFFUSION IN YOKKAICHI CITY. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 4p.

The relationship between air pollution and the meteorological conditions of smoke diffusion in Yokkaichi and its suburbs is discussed. The principle meteorological conditions that were measured include wind direction, wind speed, temperature, and humidity up to 500 m above the ground; vertical distribution of wind direction, wind speed, and temperature near the ground; and vertical variation range in wind direction at 8 m above the ground. The data concerning air pollution included sulfur dioxide concentration at several places, discharge rate/hour of SO2 temperature, and venting velocity of 30 chimneys in the suburbs. Relationships were determined between various meteorological conditions and SO2 concentration, and C/Q was derived as a diffusion potential. The total discharge rate of SO2 to the windward of the measuring area is represented by Q, and C represents SO2 conceatration. The probability of a high SO2 concentration was high when the discharge source was to the windward. When the wind speed was 5-8 m/s at Isozu and 1-2 m/s at Mihama Primary School, C/Q was maximum. Both the temperature gradient at 100 m and 300 m and C/Q were in proportion. Relationships between turbulence, stability, and C/Q were also investigated.

8097 APTIC NUMBER 19828

Yanagihara, Shigeru
PHOTOCHEMICAL REACTIONS OF AUTO EXHAUST. (Jidosha haikigasu no kokagaku hanno). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8(2):10-17, June 1970. 5 refs.

Control is quite difficult of the automotive emissions of nitrogen oxides and hydrocarbons which contribute to the production of photochemical smog, resulting in eye irritation and plant damage. In connection with this problem, a brief description of the effect of solar radiation in terms of wave length, energy, and irradiation angle on the absorption mechanisms of various substances is presented tabularly and graphically. Possible chemical reactions due to the radiation energy of fluorescent light as well as solor radiation are described in terms of reaction formulae. A smog chamber was used to investigate the photochemical effect, while radiation source was a set of three hundred 100 W fluorescent lamps with the intensity of 1000 micro-W per sq cm (3450-3550 A). The chamber which was about 11 cu m, contained various measurement devices, radiation and dilution sources, as well as a chassis dynamometer to simulate different driving and idling conditions in order to produce exhaust gases. The general schematic diagram is given. Data are plotted for the irradiation of nitric oxide plus ethylene, showing that the smaller the initial concentration of NO, the larger the rate of increase of NO2 and the faster the formation of oxidants. The faster the reaction, the higher the HC/NO ratio will be. Data are presented for actual exhaust gases under simulation conditions, and also for the effects of different types of hydrocarbons. Definite relations were observed between the initial concentrations of NO and HC and the resulting concentration of oxidants. Reported connections with many types of HC, such as paraffin, olefins, and alkyl benzene, and the degree of irritation of the eyes are quantified in terms of a mathematical formula. A list of reactivity of organic materials is included, according to ozone or oxidants, peroxides, formaldehydes, aerosols, eye irritation, plant damage, and average reactivity index.

8098 APTIC NUMBER 19057

Yordanov, D. L.
ON DIFFUSION FROM A POINT SOURCE IN THE SURFACE LAYER OF THE ATMOSPHERE. (O diffuzii primesi of tochechnogo istochnika v prizem nom sloye atmosfery). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, vol. 2:576-584, 1968. 12 refs.

Diffusion from a point source in the atmospheric surface layer is studied. The horizontal downwind diffusion is considered statistically, while the vertical diffusion is determined as a solution of the semi-empirical equation of turbulent diffusion. The vertical diffusion for unstable stratification is considered as a two-layer problem. The results of calculations are in qualitative agreement with experimental data. (Author abstract)

8099 APTIC NUMBER 19154

Yordanov, Dimiter
ON TURBULENT DIFFUSION FROM A STEADY LINE SOURCE IN THE SURFACE LAYER UNDER UNSTABLE STRATIFICATION. Pure Appl. Geophys. (Basel), vol. 69:229-236, 1968. 6 refs.

Because of the presence of the earth's surface, eddies in the vertical direction are limited and the vertical diffusion in the surface layer is mostly due to the small scale turbulence. This makes it possible to describe diffusion from a steady line source perpendicular to the wind direction with a semiempirical equation of diffusion. Solution of the diffusion equation is obtained for a linear source in the boundary layer with unstable stratification, when the Monin-Obukhov similarity theory is used for the wind profile and coefficient of vertical turbulent exchange. On the basis of the solution obtained, numerical calculations are made. (Author abstract modified)

8100 APTIC NUMBER 21958

Albertson, M. L., Y. B. Dai, R. A. Jensen, and Hunter Rouse
DIFFUSION OF SUBMERGED JETS. Trans. ASCE (Am. Soc. Civil Engrs.), vol. 115:639-697, 1950. 40 refs.

As the direct result of turbulence generated at the borders of a submerged jet, the fluid within the jet will undergo both lateral diffusion and deceleration, and at the same time fluid from the surrounding region will be brought into motion. The approximate characteristics of the corresponding mean flow pattern are derived analytically, with the exception of a single experimental constant, through assumptions that: (1) the pressure is hydrostatically distributed throughout the flow; (2) the diffusion process is dynamically similar under all conditions; and (3) the longitudinal component of velocity within the diffusion region varies according to the normal probability function at each cross section. Experimental data are presented that justify the analysis and provide the necessary coefficients for flow from both slots and orifices. All results are reduced to a form immediately useful for design purposes. (Author abstract)

8101 APTIC NUMBER 21923

Allen, Eric R. and James N. Pitts, Jr.
THE VAPOR-PHASE PHOTOLYSIS OF TRANS-CROTONALDEHYDE. J. Am. Chem. Soc., 91(12):3135-3139, June 4, 1969. 18 refs. (Presented at the American Chemical Society National Meeting, 144th, Los Angeles, Calif., April 5, 1963.)

The vapor-phase photolysis of trans-crotonaldehyde (2-buten-1-al) was investigated at 2650-2537 over a wide range of intensities, pressures, and temperatures. At 25 deg, this alpha, beta-unsaturated aldehyde was unusually stable; polymerization was the only significant reaction. Above 100 deg, reactions leading to the formation of gaseous products became important. The main products in decreasing order of abundance were carbon monoxide, propylene, hydrogen, and methane. Quantum yield was inversely proportional to the initial crotonaldehyde pressure and exceeded unity at 120 deg and pressures below 10 torr. At 120 deg, quantum yield was directly proportional to the incident light intensity; at temperatures greater than 200 deg, the dependence was much less marked. A decomposition mechanism is suggested in which the absorption of radiation initially produced long-lived, thermodynamically unstable isomers, and subsequently a free-radical chain process was initiated by the second photolysis and/or thermolysis of one or more of these isomers. (Author abstract)

8102 APTIC NUMBER 12138

Altshuller, A. P. and Stanley F. Sleva
THE RAPID CONVERSION OF NITRIC OXIDE TO NITROGEN DIOXIDE IN THE PHOTOOXIDATION OF ORGANIC COMPOUND NITRIC-OXIDE MIXTURES. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Lab. of Engineering and Physical Sciences, 10p., 1963 (7). 11 refs.

The formation of nitrogen dioxide as a function on irradiation time was measured in the presence of various organic substances, oxygen, and ultaviolet radiation. Colorimetric analyses were performed at intervals during irradiation of plastic bags containing mixtures of nitric oxide and the organic compound; irradiation was continued until the NO2 passed through a maximum concentration and then began to decrease. The formation of ozone and other organic peroxy compounds was also measured by means of oxidation of the iodide ion to triiodide ion in neutral solution. Oxidation rates of 0.005 to 0.007 ppm/min were obtained both in the dark and in the presence of ultraviolet radiation, when measured at 3 ppm of NO and 200,000 ppm of oxygen. The effects of various organic species under different light conditions are discussed. The photolysis of NO2 increased with an increase in radiation intensity; but the rate of conversion of NO to NO2 also increased. Considerable additional experimental work is necessary, but results to date indicate that the rapid conversion of NO to NO2 and oxidant formatic are not limited to olefins, as previously believed by some investigators.

8103 APTIC NUMBER 19061

Amoore, John E., James W. Johnston, Jr., and Martin Rubin
THE STEREOCHEMICAL THEORY OF ODOR. Sci. Am., vol. 210:42-49, 1964.

New evidence has shown that the geometry of molecules is the main determinant of odor, and a stereochemical theory of the olfactory process has been developed. It has been suggested that the olfactory system is composed of different types of receptor cells, each representing a distinct odor. The odorous molecules produce their effects by fitting into receptor sites on these cells. There are seven primary odors: camphoraceous, musky, floral, peppermint, ethereal, pungent, and putrid. Every known odor can be made from these seven by mixing them in certain proportions. Camphoraceous molecules are spherically shaped and approximately seven angstroms in diameter. Therefore, it is believed that the receptor site for these molecules is a hemispherical bowl about seven angstroms in diameter. The musky odor is accounted for by disk-shaped molecules about 10 angstroms in diameter. The floral odor is caused by disc-shaped molecules with a flexible tail attached. The peppermint odor is caused by wedgeshaped molecules with an electrically polarized group of atoms, capable of forming a hydrogen bond, near the point of the wedge. The ethereal odor is due to rod-shaped molecules. In each of these cases, the receptor site is the nerve endings, presumably the shape and size of the molecule. Pungent odors are caused by electrophilic molecules, while putrid odors are due to nucleophilic molecules. Tests conducted to confirm the validity of this theory are also discussed.

8104 APTIC NUMBER 19436

Angelillo, B.
MANGANESE IN DRINKING WATER. (Il Mn nelle acque destinate ad uso potabile). Igiene Mod. (Parma), vol. 54:3-34, Jan.-Feb. 1961.

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72 refs. Translated from Italian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 34p., Oct. 27, 1969.

Manganese in drinking water, it origin, the problems it causes, and its removal are discussed. Though manganese represents only 0.1% of the earth's crust, standing water (but not running water) has a tendency to concentrate it; concentrations in excess of 20 ppm have been obtained in some reservoirs. While manganese is essential to plants, it can do expensive damage in paper mills, wood pulping, and the manufacture of rayon and plastics. In the home, it can leave hard-to-remove stains on laundry and reduce or stop the flow of water by precipitating on the walls of pipes. The development of removal techniques is traced through the years and several of the more successful techniques that have evolved are presented. General categories of techniques discussed are mechanical, ion exchange, chemical, and catalytic, with combinations thereof representing the most common applications.

8105 APTIC NUMBER 19175

Ashton, J. T., R. A. Dave, K. W. Miller, E. B. Smith, and R. J. Stickings
THE SOLUBILITY OF CERTAIN GASEOUS FLUORINE COMPOUNDS IN WATER.
J. Chem. Soc., no. 8:1793-1796, 1968. 22 refs.
CFSTI, DDC: AD 678233

An apparatus designed for especially low solubilities was used to determine the solubilities of tetrafluoromethane, sulfur hexafluoride, and nitrogen trifluoride in water from 0 to 50 deg, while the changes in heat content and entropy were estimated from the temperature-dependence of the solubilities. The apparatus, sensitive to gas solubilities on the order of 10 to the minus 6th power mole fraction, differs from its predecessors in that it allows the bulk of gas measurement to be performed under 'dry' conditions, or in other words unsaturated with solvent vapor. An additional arm of the solubility vessel acts as a manometer, allowing the pressure to fall as the gas is dissolved, permitting equilibrium to be reached more rapidly. On the basis of observations and a review of the literature, it was concluded that the low solubilities of fluorinated gases are not due to specific anomalous factors that cause large negative entropies of solution, but the entropies appear to be related to the relatively larger size of the fluoride molecules in comparison with the inert gases, which are most frequently used as comparison standards.

8106 APTIC NUMBER 19582

Aubry, M., P. Gilot, and C. Jayles
SOLUBILITY OF SULFUROUS ANHYDRIDE IN CHLORINATED SOLVENTS.
(Solubilite de l'anhydride sulfureux dans les solvants chlores).
Text in French. Ann. Genie Chim., 1967:73-75. 2 refs.

The systems SO2-SO2Cl2, SO2-SOCl2, SO2-CH2Cl2, and SO2-C2H4Cl2 were studied in the gas and vapor phase by gas-phase chromatography. The results relate to the following: sulfuryl chloride isotherms given by the vapor tensions, and thionyl chloride wherein the methylene chloride, dichloro -1-2- ethane isobar curve given under 760 mm Hg.

8107 APTIC NUMBER 19497

Azatyan, V. V., N. P. Andreeva, E. T. Intezarova, and V. N. Kondratiev
ESR STUDY OF THE REACTION BETWEEN OXYGEN ATOMS AND CARBON MONOXIDE. (Izuchenie reaktsii atomov kisloroda s okis'yu ugleroda metodom EPR). Text in Russian. Kinetika i Kataliz, 11(2):290-295, 1970. 30 refs.

The kinetics of the reaction of atomic oxygen with carbon monoxide were studied by electron spin resonance at room temperature. The preparation of the chemicals and the arrangement of the experiment are described. The reaction was third order. The rate constants of the reactions O + CO + CO equals CO2 + CO and O + CO + Ar equals CO2 + Ar were 1.01 plus or minus .18 times 10 to the minus 34th power and 1.8 plus or minus .24 times 10 to the minus 34th power (cm to the sixth power molecule to minus second power sec to minus first power), respectively, the results are compared with literature data which are not in good agreement with one another. These are critically evaluated and the reasons of disagreement between presented measurements and various literature sources are discussed.

8108 APTIC NUMBER 19377

Bacon, Raymond F. and Henry T. Hotchkiss, Jr.
RECOVERY OF SULPHUR AND IRON OXIDE. (Assignee not given.)
U. S. Pat. 1,917,789. 5p., July 11, 1933. (Appl. Feb. 26, 1930, 5 claims).

A method for recovering sulfur and iron oxide from heavy metal sulfide ores is described. The iron sulfide-bearing ore is reacted with chlorine to produce ferrous chloride and elemental sulfur at a temperature sufficient to vaporize the sulfur. The elemental sulfur is collected and condensed, and the ferrous chloride residue is heated in the presence of air to form and vaporize ferric chloride forming ferric oxide. Ferric chloride vapors are condensed to remove any inert gases or chlorine, and then hydrolyzed to form ferric oxide and hydrogen chloride. The ferric oxide will be produced in the form of a fine powder which may settle out in the reaction chamber. Hydrogen chloride is introduced into a catalytic reaction chamber containing ferric oxide which acts as a catalyst for promoting the reaction between the HCl and the oxygen of the air to produce chlorine. The chlorine is returned to the process for reaction with additional iron sulfide-bearing ore.

8109 APTIC NUMBER 17952

Barrer, R. M. and N. T. Chio
SOLUTION AND DIFFUSION OF GASES AND VAPORS IN SILICONE RUBBER MEMBRANES. J. Polymer Sci., no. 10:111-138, 1965. 34 refs.

Solution and diffusion of He, Ne, Ar, Kr, Xe, H2, N2, O2, and n-C4H10 were studied in filled dimethylpolysilcxane elastomers

(at temperatures between 0 and -37 C for all penetrants, and down to -78 C for some). Crystallization of the rubber, commencing at about -50 C, resulted in large decreases in permeability and diffusion coefficients and smaller decreases in solubility. Diffusion coefficients were measured in three different ways, and solubility coefficients, in two. Above the crystallization temperature, the results by all methods agreed for a lightly filled rubber; but for a rubber with a high filler content, especially when partially crystalline (i.e., below -50 C), differences were observed between solubility coefficients measured directly and those derived from permeation and diffusion. These differences are related to the heterogeneity of the medium and to consequent differences in diffusion coefficients obtained by the time-lag and steady-state methods. Diffusion and solubility coefficients both show relationships with other physical properties. Permeabilities of the silicone rubbers to gases are high, and selectivity can be good between appropriate pairs of molecules. (Author abstract modified.)

8110 APTIC NUMBER 21912

Baum, E. J., L. D. Hess, J. R. Wyatt, and J. N. Pitts, Jr.
MOLECULAR STRUCTURE AND PHOTOCHEMICAL REACTIVITY. X. ALIPHATIC HYDROXY KETONES. J. Am. Chem. Soc., 91(10):2461-2466, May 7, 1969. 38 refs.

Irradiation of an alpha-hydroxy aliphatic ketone, 3-hydroxy-2-butanone (acetoin) at 3130 Angstroms yields acetaldehyde with the same quantum yield in both gas-phase and liquid solutions. The vapor phase quantum yield of acetaldehyde is not significantly affected by changes in temperature, but large, temperature-dependent and equal yields of carbon monoxide and methane were observed along with minor yields of ethanol and biacetyl. A large, solvent-dependent yield of ethanol was noted in the liquid phase. Results are interpreted on the basis of two primary photochemical reactions: (1) an intramolecular rearrangement of an excited acetoin molecule to form two molecules of acetaldehyde, and (2) dissociative processes giving radicals which further react in a sequence of secondary reactions. The major product of photolysis at 3130 Angstroms and 25 deg in toluene solution was 2-butanone. Results of ultraviolet absorption and phosphorescence emission spectroscopy indicate that both hydroxy ketones have excited singlet and lowest lying triplet states. (Author abstract modified)

8111 APTIC NUMBER 19372

Benson, Sidney W. and H. Edward O'Neal
KINETIC DATA ON GAS PHASE UNIMOLECULAR REACTIONS. Natl. Bur. Std. (U. S.) Natl. Std. Reference Data Ser., no. 21:645p., Feb. 1970. 70 refs.

Available rate data on thermally induced, unimolecular, homogeneous gas phase reactions of molecules and free radicals were compiled as a basic reference. Literature through Dec. 31, 1966 was reviewed for inclusion. Reactions of special interest appearing in print through Feb. 1968 were also included. The collection was limited to the reaction kinetics of thermally equilibrated molecules and free radicals. Ionic species were not included. Also omitted were the reaction kinetics of vibrationally and/or electronically energetic reactive intermediates produced photochemically, by chemical activation, or by high- energy radiation. Unimolecular reactions which are not first-order were reviewed only in those cases where extrapolations or calculations were made to provide estimates of the limiting high-pressure first-order rate constants. Evaluations were made of reported kinetic parameters. The theory and assumptions used in compiling the data were discussed, as were mechanisms of reaction and preferred values. The bulk of the work consists of selected data with references in the form of data sheets.

8112 APTIC NUMBER 19067

Black, Graham
ENERGY TRANSFER REACTIONS INVOLVING METASTABLE SPECIES OF ATMOSPHERIC INTEREST. (FINAL REPORT). Stanford Research Inst., Menlo Park, Calif., ARO Contract DAHC04-69-C-0048, Proj. 2006:102B13B, Rept. 8279.2-C, 12p., Jan. 1970. 27 refs.
CFSTI, DDC: AD 701911

Energy transfer reactions of electronically excited atomic and diatomic species were studied. The excited species were created by vacuum ultraviolet irradiation of simple molecules; image-tube spectrographs and filtered photomultipliers were utilized to detect and monitor emission features. Quantum yields for excited states were deduced from absolute intensity measurements. A pulsed photolysis-signal integration system was used to determine absolute rate coefficients for energy transfer reactions of excited oxygen, nitrogen, and carbon monoxide. Resonance fluorescence scattering was used to measure excited oxygen, carbon monoxide, and nitric oxide. (Author abstract modified)

8113 APTIC NUMBER 19901

Bonnefois, Jacky and Michel Destriau
EXPLOSIVE DECOMPOSITION OF NITROUS OXIDE. MODIFICATION OF HEAT TRANSFERS. (Decomposition explosive de l'oxyde azoteux, modifications des transferts de chaleur). Text in French. Bull. Soc. Chim. France, no. 6:2113-2117, June 1970. 15 refs.

From equations derived from the thermal theory of explosions, the measured and theoretical values of the explosion limit pressures for the explosive decomposition of nitrous oxide were compared under various conditions of heat transfer. The heat transfer was altered by using inert gases or by varying the geometry of the reactors. Values for the frequency factor and activation energy, which are in good agreement with those reported in the most recent literature, are given. (Author abstract modified)

8114 APTIC NUMBER 19065

Bras, G. H. P.
THE DESIGN OF COOLER-CONDENSERS. Ind. Chemist, 33(394):608-612, Dec. 1957. 9 refs.

Equations are derived relating the ratio of the total- and latent heat transfer coefficient, and also the ratio of the total- and sensible heat transfer coefficient to the Clausius-Clapeyron equation or the slope of the saturation curve. By using the equations for the design of cooler-condensers, either the heat- or mass-transfer coefficient may be eliminated from the design equation for total heat flux. In this way the design procedure can be simplified and speeded up while the use of a graphical method for the determination of the gas-liquid interface conditions may avoid tedious trial and error computations or restrict them to a minimum. An example is worked out for a cooler-condenser handling a saturated mixture of carbon dioxide and water vapor. The tube surface calculated showed a deviation of - 0.7% as compared with tube area calculated by the Colburn-Hougen trial and error method. The ratio of the total- and latent heat transfer coefficient calculated by application of the new equations showed point to point deviations from the true values ranging between about 0.1 and 3.5%. (Author summary modified)

8115 APTIC NUMBER 21714

Brown, F. B. and P. H. Crist
FURTHER STUDIES ON THE OXIDATION OF NITRIC OXIDE; THE RATE OF THE REACTION BETWEEN CARBON MONOXIDE AND NITROGEN DIOXIDE. J. Chem. Phys., Vol. 9:840-846, Dec. 1941. 8 refs.

The initial rate of the reaction between carbon monoxide and nitrogen dioxide from 225 to 290 C was measured under conditions which precluded the possibility of NO2 decomposition. This study extends the earlier data on the reaction over a 300 deg temperature interval. The oxidation of nitric oxide at 25 C and at pressures from 0.01 to 0.1 mm of NO was a third order over a 3- and 6-fold change in reactants. The CO2 and NO2 production in systems containing NO, CO, and O2 around 150 C was measured under conditions in which the formation of CO2 by the reaction between CO and NO2 was negligible. It is concluded that NO3 is the intermediate needed to correlate this and previous data on reactions involving NO and NO2 and that the rate of the reaction of NO3 with NO is faster than with CO. A new apparatus containing greaseless valves capable of handling quantities of products of the order of 0.001 mm, and a method of analysis precise to 3 times 10 to the minus 5th power mm was devised. Methods to prepare reactant gases of the required purity are described. (Author abstract modified)

8116 APTIC NUMBER 21706

Bryantseva, N. P. and S. F. Khvostenkov
INFLUENCE OF CALCINATION CONDITIONS ON THE PHYSICOCHEMICAL PROPERTIES OF DOLOMITES. J. Appl. Chem. USSR (English translation from Russian of: Zh. Prikl. Khim.), 41(6):1128-1133, June 1968. 7 refs.

The extensive use of dolomites in the building industry is retarded by certain technological difficulties due to the specific properties of lime made from dolomite. The influence of calcination conditions on the physicochemical and technological properties of lime made from dolomites was studied. Two varieties of dolomite and quartz tailings from the Olenogorsk Mining and Ore Dressing Combine were used in the work. Petrographic analysis showed that the dolomite was a quartz-carbonate rock containing small amounts of colorless mica, chlorite, and feldspars. The quartz tailings were a waste product from concentration of iron ore (ferruginous quartzite). The iron was present mainly as magnetite; hematite was less abundant. The silicate component consisted of quartz and, to a lesser extent, of amphiboles. Small amounts of feldspar, pyroxene, garnet, mica, and calcite were present. Temperature and duration of dolomite calcination were the decisive factors for production of dolomite lime suitable for manufacture of autoclaved silicate materials. The optimal calcination temperature, ensuring production of high-quality materials, is 950 C. The calcination time at this temperature depends on the lump size.

8117 APTIC NUMBER 19347

Buckley, Donald H.
EFFECT OF SULFUR, OXYGEN, AND HYDROGEN SULFIDE SURFACE FILMS ON THE ADHESION OF CLEAN IRON. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TN D-5689, 16p., March 1970. 13 refs.

Studies were made in a vacuum apparatus containing both LEED and an Auger spectrometer to determine the presence and arrangement of sulfur, oxygen, and hydrogen sulfide on an iron (011) surface before and after adhesive contact. Experiments were conducted with a 3.0-millimeter-diameter flat iron surface contacting a larger 8.0-millimeter-diameter crystal flat, and forces applied to the surfaces in contact varied from 20 to 350 dynes. Sulfur and hydrogen sulfide present on iron exerted a greater influence than oxygen on the reduction of the adhesion of iron to itself. The adhesion force decreased with increased surface coverage of hydrogen sulfide on the iron surface, while monolayer coverage of the iron surface afforded the greatest reduction in adhesion. With hydrogen sulfide adsorption, three surface structures were observed, with one full monolayer coverage that formed a close-packed layer on the surface. Auger analysis of an iron surface in the process of cleaning revealed that the principal material that diffuses to the surface, making obtaining a clean surface difficult, is sulfur rather than carbon, as previously believed.

8118 APTIC NUMBER 21993

Bufalini, J. J., R. W. Gay, and S. L. Kopczynski
OXIDATION OF N-BUTANE BY THE PHOTOLYSIS OF NO2. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 15p., 1970 (?). 11 refs.

The photooxidation of n-butane in the presence of nitrogen oxides was investigated. Although its reactivity is low, n-butane readily oxidizes nitric oxide. The usual products are ozone,

PAN, and aldehyde. A mechanism for photooxidation is discussed. Hydroxyl radicals are postulated as the principle chain-propagating free radicals. (Author abstract)

8119 APTIC NUMBER 20086

Bulang, W., W. Groth, I. Jordan, W. Kolbe, F. Mann, and K. H. Welge
ON THE SEPARATION POTENTIAL OF THERMALLY DRIVEN COUNTERCURRENT GAS CENTRIFUGES. II. ASYMMETRICAL SEPARATION PROCESS. Z. Physik. Chem. Neue Folge, (Frankfurt), vol. 24:249-264, 1960. 4 refs. Translated from German by Kurt H. Quasebarth, Virginia Univ., Charlottesville, Div. of Engineering Physics, 22p. Sept. 1960.

The theory of separation potential with respect to thermally driven countercurrent gas centrifuges is extended and experimental results are presented. Maximum separation potential occurs when the tapping ratio (i.e, ratio of light fraction molar flow to total molar flow) ranges from 0.3 to 0.4. In this case, enrichment of the light fraction is substantially greater than in the symmetrical case (i.e., tapping ratio of 0.5). Design improvements of the ZG5 gas centrifuge are given. The results are important for isotope separation.

8120 APTIC NUMBER 19615

Chertkov, B. A.
COEFFICIENTS OF MASS TRANSFER DURING ABSORPTION OF SULFUR DIOXIDE FROM GASES BY SOLUTIONS OF MAGNESIUM SULFITE AND BISULFITES. (Koeffitsienty massoperedachi pri pogloshchenii dvuokisi sery iz gazov rastvorami sul'fit-bisul'fita magniya). Text in Russian. Khim. Prom. (Moscow), vol. 5:57-61, 1963. 9 refs.

Available data on mass transfer in the sulfur dioxide - magnesium sulfite and bisulfite system are described. With a pH of 6.1-6.2 in the absorbing solution, resistance in the liquid phase is negligibly small, and the overall coefficient of mass transfer may be set equal to the partial coefficient for the gaseous phase using a Nusselt number equal to 0.0035Re(gas)Re(liquid) to the 0.4th power (Re is Reynolds number). This value is applicable for SO2 absorption by other alkaline absorbers also.

8121 APTIC NUMBER 19623

Chertkov, B. A.
COEFFICIENT OF MASS TRANSFER FOR THE ABSORPTION OF SO2 IN A MULTISTAGE ABSORBER. (Koeffitsienty massoperedachi pri pogloshchenii SO2 v mnogostupenchatom absortere). Text in Russian. Khim. Prom. (Moscow), no. 7:31-34, 1960. 6 refs.

The kinetics of sulfur dioxide absorption by an ammonium sulfite-bisulfite solution was studied experimentally with initial SO2 concentrations of 0.33-2.56% (corresponding to an 89.7-91.2% SO2 removal). A six-stage foam absorber with process capacity of 10,000 cu m/hr was employed. Average values for the coefficient of mass transfer varied from 1450 to 1970 moles/sq m-h-%SO2 and were shown experimentally to be valuable as design criteria for such absorbers. This coefficient was found to increase with linear gas flow rate more rapidly than does the total hydraulic resistance of the absorber, optimum flow rate ranging from 2.5-2.7 m/sec.

8122 APTIC NUMBER 19621

Chertkov, B. A.
EFFECT OF ABSORBENT COMPOSITION ON RATE OF SO2 ABSORPTION FROM GASES. (O vliyanii sostava absorbenta na skorost' pogloshcheniya SO2 iz gazov). Text in Russian. Khim. Prom. (Moscow), no. 3:47-51, 1960. 11 refs.

In the absorption of sulfur dioxide by ammonium sulfite-bisulfite solution, the coefficient of mass transfer was demonstrated to be dependent on change in the free chemical capacity and viscosity of the absorbent. Studies were made with an SO2 concentration of 0.3-9 vol % at 23-25 C. Absorbent flow rate was 10.7 l/cu m with an irrigation rate of 2 l/min; effective NH3 content of the absorbent was 4.3-4.7 mole/liter. Data are tabulated for average absorbent capacities of 0.04-0.77 mole/l and dynamic viscosity of 1.20-3.6 cp.

8123 APTIC NUMBER 19905

Chigusa, Masoru and Shigenori Akai
THE MANUFACTURING METHOD OF ADSORPTIVE POROUS CARBON. (Kyuchakusei o yusuru takoshitsu arbon no seiho). Text in Japanese. (Mitsubishi Yuka, Ltd., Yokkaichi (Japan)) Jap. Pat. Sho 45-5685. 3p., Feb. 25, 1970. (Appl. May 28, 1964, claims not given).

In the manufacturing process of synthetic gas from various liquid hydrocarbons(HC), carbon is produced as a byproduct. This carbon lacks micro-pores and is not useful as an adsorbent. There are several methods of producing active carbon, but they are all costly. The present invention involves the direct production of active carbon in the process of manufacturing synthetic gas from HC by the partial oxidation method. Two types of HC, one with a very high boiling point and the other with a very low boiling point, are mixed into the basic HC as small droplets by preheating (50-150 C) under pressure, thus forming a very homogeneous mixture. When the mixture is injected into the furnace at 1300-1450 C, the HC with lower boiling points vaporize and react with O2 and steam to form the primary product gas. The remaining HC eventually turns into active carbon by thermal dissociation, and it consists of 2-6% of the original amount of carbon. The data on the new active carbon indicate that it is purer, larger in surface area (1500 - 2000 sq m/gm) and higher in adsorption rate compared to the active carbon made by the conventional processes.

8124 APTIC NUMBER 21963

Cole, Philip and Irwin Parnet
FUEL ADDITIVE ATOMIZATION IN JET ENGINE TAILPIPES. (FINAL REPORT). Leasco Systems and Research Corp., New York, OAR Contract

F19628-68-C-0376, Proj. 8679, Task 867902, Work Unit 86790201, AFCRL-70-0031, 32p., Jan. 30, 1970. 11 refs.
CFSTI, DDC: AD 701067

A study was conducted to determine the factors which control the droplet size distribution produced by injecting a liquid into the tailpipe region of a turbojet engine. There appears to be reasonable agreement between two models for cross-stream injection: the theoretical model developed by Adelburg and the empirical correlation model developed by Ingebo and Foster. Mean and volume-median drop sizes using these models indicate that there may be some difficulty in producing drops in the 40-micron range. Surface tensions and viscosity of the injected liquid and orifice diameter should be minimized. Orifice diameters as small as 0.0254 cm have been used for injecting ethanol; diameters of 0.0254 to 0.01016 have been used for injecting isooctane, benzene, carbon tetrachloride, and water. The surface tension and viscosity of liquids decrease rapidly in the temperature range of 0-80 C. This behavior should be exploited to reduce mean droplet size. The techniques of dimensional analysis should be used to assist in the development of an empirical correlation model. A computer-based model should be used to improve the existing theoretical models of the jet disintegration and atomization process. (Author conclusions modified)

8125

APTIC NUMBER 19328

Costin, J. M.
VISUAL OBSERVATION OF SUSPENDED-PARTICLE DISTRIBUTION AT THREE SITES IN THE CARIBBEAN SEA. J. Geophys. Res., 75(21):4144-4150, July 20, 1970. 11 refs.

Maxima and minima in concentrations of suspended particulate matter were observed from manned submersible vehicle at three dive sites in the Western Caribbean area. Although depths of observed particulate maxima were different in each area, the layers of densest particle concentration were found between the 9 C and 12 C isotherms. This temperature level is generally coincident with the boundary between water of the Subtropical Undercurrent and Subantarctic Intermediate Water. It is believed that particle layers are a common feature of Caribbean stratification and result from low particle settling velocities, sediment erosion, and decreased vertical mixing at the depth of the thermal boundary. (Author abstract modified)

8126

APTIC NUMBER 21929

Cruickshank, F. R. and S. W. Benson
SOME THERMOCHEMICAL PROPERTIES OF METHYL VINYL ETHER, ALPHA-CHLOROETHYL METHYL ETHER, AND IODOMETHYL METHYL ETHER. EVIDENCE FOR NONBONDED ELECTROSTATIC INTERACTIONS. J. Am. Soc., 91(10):2487-2492, May 7, 1969. 20 refs.

The entropies of methyl vinyl ether and alpha-chloroethyl methyl ether were calculated, respectively, by statistical mechanical methods, and from the measured equilibrium constant. In the latter measurement, hydrogen chloride pressures were varied from 104.5 to 227.8 torr, and methyl vinyl ether from 28.57 to 213 torr. The heat of formation of iodomethyl methyl ether was calculated from the equilibrium constant and an assigned value for the entropy of the iodomethyl ether. Iodine pressures were varied 3.76 to 18.85 torr and dimethyl ether pressures from 39.62 to 592 torr. The temperature range was 515-631 K. Values obtained are consistent with an electrostatic interaction of the halogens with the terminal methyl group arising from the alternate polarity of bond dipoles. (Author abstract modified)

8127

APTIC NUMBER 19136

Cruickshank, F. R. and S. W. Benson
THE CARBON-HYDROGEN BOND STRENGTH IN DIMETHYL ETHER AND SOME PROPERTIES OF IODOMETHYL METHYL ETHER. Intern. J. Chem. Kinet. vol. 1:381-390, July 1969. 19 refs.

The kinetics and mechanism of the reaction between iodine and dimethyl ether (DME) were studied spectrophotometrically from 515-630 deg K. over the pressure ranges 3.8-18.9 torr for iodine and 39.6-592 torr for DME in a static system. When an energy value was assigned to the carbon-hydrogen bond strength of DME, it was possible to examine the effects of substituents at the oxygen atom on the carbon-hydrogen bond strength in the methoxy group. The experimental material and procedures are described. Some nmr and uv spectral features of iodomethyl ether are reported. (Author abstract modified)

8128

APTIC NUMBER 19627

Desai, S. V. and W. H. Corcoran
RECOMBINATION OF ELECTRONS AND IONS IN AN ATMOSPHERIC ARGON PLASMA. J. Quant. Spectro. Radiative Transfer, vol. 9:1371-1386, 1969. 25 refs.

Spectroscopic studies were made of a plasma jet of argon at atmospheric pressure. Analysis of temperatures, velocities, and excitation populations allowed the determination of the recombination coefficient for electrons and ions and prediction of a dissociative-molecular-ion model to describe the mechanism of the recombination. Temperatures were in the region from 3000 to 11,000 K and electron densities in the range from 10 to the 12th power to 10 to the 15th power particles per cu cm. In partial support of the proposed mechanism, it was observed that the addition of bimolecular gases capable of forming molecular ions resulted in quenching of line radiation from the argon plasma as a result of increased rates of recombination of electrons. (Author abstract modified)

8129

APTIC NUMBER 19478

Desgrandchamps, G.
STUDY OF CATALYSTS FOR THE UNION OF SULFURIC ACID FROM THE S.N.P.A. IN LACQ. (Etude de catalyseurs pour l'unite d'acide sulfurique de la S.N.P.A. a Lacq). Text in French. Ann. Genie Chim., 1967:162-174. 9 refs. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.)

A study was conducted to compare the activities of three commercial catalysts for the conversion of sulfur dioxide to sulfur trioxide. Small SO2 concentrations, wet catalysis, and the presence of hydrogen and carbon monoxide were investigated. The gas composition was very close to that of an integral isothermal reactor. It was first verified that the presence of H2 and CO was not changing the thermodynamic equilibrium of the reaction by oxygen consumption nor by a temperature rise in the adiabatic converter resulting from the oxidation heat. The kinetics of the SO2 conversion in an integral isothermal reactor were studied. In the absence of H2 and CO the kinetic treatment of the results gave coefficients of equations that were in agreement with the isothermal behavior of the catalyst. When H2 and CO were present, the results were not altered over two of the catalysts. It seems that the three oxidations occurred in parallel, without reciprocal inhibition or competition for the catalyst. (Author abstract modified)

8130 APTIC NUMBER 19041

Dickens, W. A. and A. W. Plummer
CORRELATION OF EQUILIBRIUM DATA FOR THE SYSTEM SO2-H2O-CAO. TAPPI, 40(11):895-899, Nov. 1957. 10 refs.

A careful literature survey was made to locate equilibrium vapor pressure-composition-temperature data for the sulfur dioxide-water-calcium oxide system. Data thus obtained was statistically correlated by a modified Cox-Othmer method over a total SO2 concentration range of 1-6 grams of SO2/100 grams of water. The correlation was achieved by discarding the data of investigators, which differed significantly from the remaining data. The data are successfully correlated at different concentrations by a logarithmic equation. Values for the slopes and intercepts within these concentration ranges are presented. (Author abstract modified)

8131 APTIC NUMBER 19334

Dinerman, Carl E. and George E. Ewing
INFRARED SPECTRUM, STRUCTURE, AND HEAT OF FORMATION OF GASEOUS (NO)2. J. Chem. Phys., 53(2):626-631, July 15, 1970. 25 refs.

Gaseous nitric oxide was examined from 4000 to 1600 reciprocal cm at 77 to 150 K with 3.9-m and 6-cm cryogenic absorption cells. Features found at 1860 and 1788 reciprocal cm exhibited a quadratic pressure dependence and were assigned to (NO)2. The band shapes of these features indicated the presence of a cis-(NO)2 isomer and possibly a trans isomer at the 1788 reciprocal cm band. The heat of formation of cis-(NO)2 is -2450 plus or minus 200 cal/mol. The best geometry consistent with the data is a N-N bond distance of about 1.75 A and a N-N-O angle of around 90 deg. Other bands due to (NO)2 are reported. (Author abstract modified)

8132 APTIC NUMBER 19305

Dishon, Menachem, George H. Weiss, and David A. Yphantis
NUMERICAL SOLUTIONS OF THE LAMM EQUATION. V. BAND CENTRIFUGATION. Ann. N. Y. Acad. Sci., vol. 164:33-51, Nov. 7, 1969. 9 refs.

Numerical and theoretical results are presented for typical concentration distributions encountered in band centrifugation in sector cells. The theoretical results include an extension of the Faxen solution for linear c-dependence to band sedimentation. This extension provides a practical method for estimating behavior of solutes of high molecular weight at high speeds. Accurate numerical solutions were obtained not only for linear c-dependence of the sedimentation coefficient but also for non-linear c-dependence through numerical integration of the Lamm equation. Both types of solutions are used to examine proposed methods of estimating sedimentation and diffusion coefficients. These solutions are also used to examine the possibility of the existence and properties of steady-state boundary sedimentation.

8133 APTIC NUMBER 19066

Driscoll, J. N. and Peter Warneck
PRIMARY PROCESSES IN THE PHOTOLYSIS OF SO2 AT 1849 A. J. Phys. Chem., 72(11):3736-3740, Oct. 1968. 18 refs.

Sulfur trioxide production in the 1849-A photolysis of pure sulfur dioxide, and in mixtures containing 5-75% SO2 in oxygen, was studied at atmospheric pressure. An interference filter isolated the 1849-1924-A lines from a mercury arc and eliminated the emission at longer wavelengths. The quantum yield found for SO3 formation in pure SO2 was 0.50 plus or minus 0.07. The addition of oxygen increased the SO3 quantum yield to a plateau value of 1.04 plus or minus 0.13, but for mixtures containing less than 30% SO2 the quantum yield declined again. SO2 photodecomposition at 1849 A is complicated by the occurrence of several primary processes including direct dissociation due to an absorption continuum, excited SO2 molecule formation, and predissociation. The observed SO3 quantum yield was utilized to evaluate the relative importance of the various primary processes, indicating that quenching of excited SO2 molecules may predominate over predissociation. (Author abstract modified)

8134 APTIC NUMBER 19307

Drummond, L. J.
SHOCK HEATING OF MIXTURES OF NITROUS OXIDE WITH CYANOGEN OR HYDROGEN CYANIDE. Combust. Sci. Technol., vol. 1:415-420, 1970. 7 refs.

Reflected shock waves were used to heat argon-diluted mixtures of nitrous oxide with cyanogen or hydrogen cyanide to temperatures between 1500 and 2000 K. Absorption spectra which were obtained during the induction period preceding the explosion of C2N2-N2O-Ar mixtures, indicated the presence of CN and NCN radicals and also of another radical, assumed to be CNN, exhibiting bands at 4090 and 4270 A. When reactant mixtures contained HCN instead of C2N2,

absorption spectra indicated the presence of CN, NCN, NH, and OH during ignition delay. Bands to CNN at 4090 and 4270 A were not apparent. The decomposition of nitrous oxide appears to be rate controlling during the ignition delay of C2H2-N2O-Ar mixtures and the appearance of NCN radicals suggests the importance of the reaction CN + N2O to yield NCN + NO. A proposed set of reactions occurring during the induction period of HCN-N2O-Ar mixtures suggests that this reaction and the reaction NO + HCN to yield CN + HNO both contribute to controlling the overall rate. (Author conclusions modified)

8135 APTIC NUMBER 19046

Eckell, J.
STUDY OF THE RELATIONSHIP BETWEEN CATALYST STRUCTURE AND CHEMICAL REACTION. II. (Ueber Zusammenhaenge zwischen Katalysatorstruktur und chemischer Umsetzung). Text in German. Z. Elektrochem., 39(7a):433-439, 1933. 22 refs.

The influence of a cold shaping process on the catalytic activity of nickel sheets was studied. Nickel sheets of 99.1% nickel and 0.59% iron were rolled to a thickness of 0.1 mm, and some sheets were recrystallized at 900 C in a vacuum after the rolling process. The catalysts were used for ethylene hydration. A marked higher activity for the rolled nickel sheet was observed. The rolled and recrystallized nickel sheets were polished, and while the polishing had no specific influence on the rolled sheets, the activity of the recrystallized nickel sheets rose to that of the rolled sheets. Polishing and rolling can be assumed to cause lattice deformation, which inturn causes the charge distribution of the affected lattice atoms changed. The activity was independent of the size of the surface.

8136 APTIC NUMBER 19396

Erdos, E.
THERMODYNAMIC PROPERTIES OF SULPHITIS. I. STANDARD HEATS OF FORMATION. Czech. Chem. Commun. (Prague), vol.27:1428-1437, 1962. 14 refs.

An equation is proposed suitable for the correlation and prediction of heats of formation of a series of salts. The equation reproduces the heats of formation of sulfates and carbonates with an average deviation of plus or minus 1.5 kcal. The heats of formation of thirty one metal sulfites are calculated and the meaning of the parameters appearing in the proposed equation is discussed. (Author abstract modified)

8137 APTIC NUMBER 19371

Fremenko, N. K., K. I. Matveev, and I. N. Rachovskaya
REACTIVITY OF PT(II) COMPLEXES IN THE OXIDATION OF CARBON MONOXIDE IN AQUEOUS SOLUTION. Kinetics Catalysis (USSR) (English translation from Russian of: Kinetika i Kataliz), 8(6): 1056-1060, Nov.-Dec. 1967. 12 refs.

The influence of the nature of the ligand on the reactivity of platinum (II) complexes in the oxidation of carbon monoxide was studied. Complexes were of the type K2PtX4 where X is equal to Cl(-), Br(-), CNS(-), or NO2(-). Reactivity of Pt(II) complexes changed inversely with the stability of the bond in the complex and directly with the trans effect of the ligand in the trans position relative to the leaving group. Another important factor was the possibility for pi-bond formation by ligands. The entry of CO into the complex PtBr4(-2) followed the bimolecular kinetic law (first order with respect to the complex and entering ligand), which is characteristic of substitution reactions in complex compounds of Pt(II). Oxidation of CO to CO2 within the complexes involving water (bromide and iodide complexes) started only after the inclusion in the coordination sphere of a second molecule of CO, the reactions being catalyzed by the reduction products of Pt.

8138 APTIC NUMBER 19288

Estes, Frances L., Albert L. Myers, and Sharon Briney
THE ANALYSIS OF MIXTURES OF GLUTAMIC AND ALPHA-KETOGLUTARIC ACIDS BY INFRARED SPECTROSCOPY. J. Appl. Spectry., 24(1):131-132, Jan.-Feb. 1970.

To explore the possibilities for quantification of mixtures of L-glutamic and alpha-ketoglutaric acids, the infrared spectra of various amounts of the individual acid were examined and the absorbence per milligram at characteristic wave numbers was determined. The aborbence of an unknown mixture at 2083.3 and 642.7 cm to the minus 1 power served as a guide in choosing the set of constants to be used for glutamic and alpha-ketoglutaric acid, respectively. Further work confirmed that absorbence was a better guide than weight for the selection of the constants. The appropriate sets of constants for each acid are given together with general absorbence formulas used for calculating the weight of each acid. Also listed are the effect of the relative and total amounts of the acids on their recovery.

8139 APTIC NUMBER 19166

Falk, Hans L., Paul Kotin, and Adele Miller
MILK AS AN ELUANT OF POLYCYCLIC AROMATIC HYDROCARBONS ADDED TO WAX. Nature (London), 183(4669):1184-1185, April 25, 1959. 1 ref.

Dairy waxes, as used commercially to impregnate milk cartons, were selected as the vehicle for incorporation of polycyclic aromatic hydrocarbons, in order to determine whether milk, a protein solution, would elute incorporated polycyclic hydrocarbons from paraffin waxes despite the hydrophobic nature of the hydrocarbons. The two polycyclic aromatic hydrocarbons chosen were 3,4-benzpyrene and 1,2,5,6-dibenzanthracene, while the types of milk selected for study were homogenized, skim milk, buttermilk, and 'half and half'. Studies were made at 20 C (room temperature) and 5 C (refrigerator temperature). Elution of benzpyrene and dibenzanthracene was observed in all milk samples studied. Homogenized milk was the best eluant, with the remaining three showing slightly less potency. There was

almost total elution of polycyclic aromatic hydrocarbons during a 54-hr period. The decrease in rate of elution incidental to the depletion of the waxes occurred as expected. At room temperature, the elution was more complete for all four types of samples. Milk, independent of its fat content, is an efficient eluting agent and solvent of benzpyrene and 1,2,5,6-dibenzanthracene from hydrophobic wax, following the incorporation of these carcinogenic hydrocarbons into wax.

8140 APTIC NUMBER 11873

Fatiadi, A. J. and A. Cohen
PHOTOCHEMISTRY OF AROMATIC AIR POLLUTANTS. National Bureau of Standards, Washington, D. C., TN-427, p. 17-31, Oct. 1967. 47 refs.

The photochemical changes of pyrene, perylene, and fluorene adsorbed on soil samples; of 1,4-dihydroxyanthraquinone on silica gel; of anthracene on carbon; and of a solution of naphthacene in benzene when exposed to air and ultraviolet radiation were studied. The products obtained by adsorption of pyrene on soil included 1,1-bipyrene and unreacted pyrene. The photochemical reaction of perylene adsorbed on soil produced 3,10 perylenequinone and other non-identified compounds. Fluorene adsorped on soil and irradiated yielded 1,2-to 2,2'-biphenylylene ethylene and pure fluorene-9-one. The other components were not identified. The 1,4-dihydrooxyanthraquinone did not undergo photooxidation on silica gel. Likewise, anthracene did not undergo photooxidation on carbon. Naphthacene was photooxidized to naphthacenequinone. By changing the length of time for the oxidation, the following yields were obtained: 55%, 90 min; 50%, 45 min; and 64%, 35 min. Chromatography yielded two other spots apart from naphthacenequinone at Rf 0.34 and 0.03 which have not been identified but are being studied further.

8141 APTIC NUMBER 21969

Foote, Christopher S., John W.-P. Lin, and S.-Y. Wong
ENAMINE PHOTOOXIDATION. Preprint, California Univ., Los Angeles, Dept. of Chemistry, 12p., 1970 (?). 12 refs.

Many compounds such as benzyne give 1,2-cyclcaddition reactions with very electron-rich olefins. The reactions proceed, depending on the system, by way of an intermediate 1,4-dipolar species (zwitterion I), a 1,4-diradical, or an apparently four-center addition. An investigation was made to determine if electron-rich olefins such as enamines would give 1,2-cycloaddition with singlet oxygen. Enamines react readily under conditions of dye-sensitized photooxygenation; reaction is equally ready whether or not there is allylic hydrogen in the original starting material. Oxygen uptake is rapid and quantitative in most cases, and ceases abruptly at one mole consumed. Experimental evidence ruled out a free radical chain process for the oxidative cleavage. Competitive photooxygenation experiments demonstrated that the reaction proceeds by way of singlet oxygen and not by way of reaction with triplet sensitizer. The fact that cleavage reactions occur only with electron-rich olefins, and the probably polymeric structure of the intermediates observed in these cases suggests that zwitterions may be short-lived precursors of the observed intermediates.

8142 APTIC NUMBER 21852

Foote, C. S., R. W. Denny, L. Weaver, Y. Chang, and J. Peters
QUENCHING OF SINGLET OXYGEN. Preprint, California Univ., Los Angeles, Dept. of Chemistry, 13p., 1970 (?). 22 refs.

Dye sensitized photooxygenation of olefins, dienes, and heterocyclic compounds proceeds by way of singlet oxygen, formed by energy transfer from triplet sensitizer to oxygen. The dyes which sensitize photooxygenations are also sensitizers for photodynamic action, a term which refers to the detrimental effects on organisms of these dyes in the presence of light and oxygen. Chlorophyll is among the most effective sensitizers for dye-sensitized photooxygenations of organic substrates. Photosynthetic organisms are apparently protected from the lethal effects of their own chlorophyll by carotenoids. It is known that beta-carotene and lycopene quench triplet sensitizers at a diffusion controlled rate; however, since oxygen also quenches triplet sensitizers at a comparable rate, quenching of triplet chlorophyll by carotenes cannot be responsible for the protective effect unless the local concentrations of carotenes greatly exceeds that of oxygen. If singlet oxygen was the reactive intermediate in the photodynamic effect, carotenoids might act by removing singlet oxygen, either by quenching or by reaction. A large variety of compounds was investigated for quenching, and the results are discussed. (Author abstract modified)

8143 APTIC NUMBER 21739

Friedlander, S. K.
BEHAVIOR OF SUSPENDED PARTICLES IN A TURBULENT FLUID. Am. Inst. Chem. Engrs. J., 3(3):381-385, Sept. 1957. 16 refs.

Heat and mass transfer and coagulation are considered as related to the mean-square relative velocity between particle and fluid and eddy diffusion as described by the mean-square particle displacement. The mathematical methods used are similar to those employed in the early calculations of the Brownian movement. The mean-square relative velocity is obtained as a function of particle characteristics, intensity of turbulence, and a fluid correlation coefficient. A general expression for the eddy diffusivity is obtained which reduces to the same form as that of the fluid for the stationary state. As a first approximation, it can be assumed that at a sufficiently long time from the introduction of the particles, fluid and particle diffusivities are equal. For short times after injection, the particle spread may be much less than that of the fluid. An illustrative calculation for the initial spreading of a jet of suspended particles is given. In all cases, an effort is made to organize the available experimental data within the framework of the theory. (Author abstract)

8144 APTIC NUMBER 19015

Furnas, C. C.
THE RATE OF CALCINATION OF LIMESTONE. Ind. Eng. Chem., 23(5):534-539, May 1931. 7 refs. (Presented at the American Chemical Society Meeting, 81st, Indianapolis, Ind., March 30-April 3, 1931.)

Calcination of limestone takes place in a very narrow zone which is the phase boundary between calcium carbonate and calcium oxide. This zone advances from the outside to the inside of the piece at a constant rate for each temperature, independently of particle size or degree of calcination. Curves and data are given for rates of calcination and temperature histories of particles. Most of the resistance to heat transfer into the piece appears to be in the narrow zone of calcination, and not in the body of the calcined material. The calcination data may be used to determine the suace area of the particles. (Author abstract)

8145 APTIC NUMBER 19158

Furuyama, Shozo, David M. Golden, and Sidney W. Benson
KINETIC STUDY OF THE REACTION CHI3 PLUS HI IN EQUILIBRIUM WITH CH2I2 PLUS I2. A SUMMARY OF THERMOCHEMICAL PROPERTIES OF HALOMETHANES AND HALOMETHYL RADICALS. J. Am. Chem. Soc., 91(27):7564-7569, Dec. 31, 1969. 13 refs.

The rate of the reversible reaction CHI3 plus HI yields CH2I2 plus I2 was followed spectrophotometrically from 158.1 to 206.1 C. The rate constant for the reaction I plus CHI3 in equilibrium with CHI2 plus I2 fits the equation log k1(reciprocal M sec) equals (11.75 plus or minus 0.17) minus (9.63 plus or minus 0.36)/ theta. This value, combined with the assumption that E2 equals 0 plus or minus 1 kcal/mole, leads to heat of formation (CHI2) equals 79.9 plus or minus 2.3 and bond dissociation energies (CHI2-I) equals 45.7 plus or minus 1.2, and (CHI2-H) equals 102.7 plus or minus 2.5 kcal/mole respectively. The heats of formation of (unmixed) halomethanes and halomethyl radicals are summarized and discussed in terms of Bernstein's interaction scheme and Pauling's bond-energy equations. (Author abstract modified)

8146 APTIC NUMBER 19005

Furuyama, Shozo, David M. Golden, and Sidney W. Benson
THERMOCHEMISTRY OF THE GAS PHASE EQUILIBRIA I-C3H7I EQUALS C3H6 PLUS HI, N-C3H7I EQUALS I-C3H7I, AND C3H6 PLUS 2HI EQUALS C3H8 PLUS I2. J. Chem. Thermodyn., vol. 1:363-375, 1969. 23 refs.

Equilibrium constants of the reactions i-C3H7I equals C3H6 + HI, n-C3H7I equals i-C3H7I, and C3H6 + 2HI equals C3H8 + I2 were measured spectrophotometrically in the gas phase between 241.8 K and 342.5 K. These results and others were used to obtain the entropies and enthalpies of formation of n- and i-propyl iodide, as well as to point out the possibility of a small discrepancy in the values for propane and propylene. The group values carried over from the thermochemical properties of 1,2-di-iodoethane and 1,2-di-iodopropane would fit the above thermochemical quantities well, indicating the absence of any 1,2-I--I interaction. Measured values of the equilibrium constants for n-PrI and i-PrI formation from HI plus C3H6 allow 'best' values to be selected for forward and reverse rate constants for these reactions and also for the I-atom catalyzed reactions. (Author abstract modified)

8147 APTIC NUMBER 21899

Furuyama, Shozo, David M. Golden, and Sidney W. Benson
THERMOCHEMISTRY OF CYCLOPENTENE AND CYCLOPENTADIENE FROM STUDIES OF GAS-PHASE EQUILIBRIA. J. Chem. Thermodyn., vol. 2:161-169, 1970. 19 refs.

The equilibrium constants of the reactions iodine plus cyclopentene yields cyclopentadiene plus 2HI and iodine plus cyclopentane yields cyclopentene plus 2HI were measured spectrophotometrically in the gas phase. They were log to the base 10(K-sub-1/atm) equals (7.55 plus or minus 0.13) minus (22.16 plus or minus 0.32) kcal reciprocal mol/RT ln 10 between 177.6 and 413.4 C, and log to the base 10(K-sub-2/atm) equals minus 1.16 plus or minus 0.02 at 317.9 C respectively. The van't Hoff parameters of K-sub-1 combined with critically selected entropies and heat capacities, yields a second-law enthalpy and entropy for cyclopentadiene of 31.9 kcal/mol and 65.6 cal/K mol respectively, in excellant agreement with the third law values and calorimetrically obtained enthalpies. The third law enthalpy of cyclopentene is 8.2 kcal/mol, which is also in excellent agreement with the calorimetric value.

8148 APTIC NUMBER 21989

Gay, B. W., Jr. and J. J. Bufalini
NITRIC ACID AND THE NITROGEN BALANCE OF IRRADIATED HYDROCARBONS IN THE PRESENCE OF OXIDES OF NITROGEN. Preprint, American Chemical Society, Washington, D. C., 20p., 1969. 16 refs. (Presented at the American Chemical Society 158th National Meeting, New York, Sept. 1969.)

In the photooxidation of systems containing hydrocarbons and nitrogen oxides in air, nitrogen balances have been poor (i.e., the amount of nitrogen consumed cannot be accounted for as products). Often, however, only gas-phase organic nitrogen products are considered; when surface-adsorbed products are analyzed, the nitrogen balances are greatly improved. Nitric acid is the principal surface product. It is believed to be formed primarily by hydrolysis of a nitrogen pentoxide intermediate on wall surfaces. (Author abstract)

8149 APTIC NUMBER 11933

Georgii, Hans-Walter
INVESTIGATION OF THE AIR EXCHANGE BETWEEN ROOMS AND THE AIR OUTSIDE. (Untersuchung ueber den Luftaustausch zwischen Wohnraeumen und Aussenluft). Arch. Meteor., Geophys., Bioklimatol., Ser. B, vol. 5:191-214, 1954. 17 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 38p.

Self-ventilation of rooms as a function of outside wind conditions was investigated with an attempt to distinguish ventilation through pores from air exchange through cracks around doors, windows, and in the floor. The affect of wind direction and inside-outside temperature difference on the volumetric air exchange were estimated. Decreases, with time, of experimentally established levels of water vapor, carbon dioxide, and aerosols in the rooms were measured. Complete exchange of the entire air volume of a standard room in one hour (ventilation coefficient equal to 1.0) required a wind velocity of 6-7 m/sec, a value which rarely occurs in cities. An average ventilation coefficient of 0.46 was obtained in carbon dioxide studies. Dependence of self-ventilation on wind direction could not be established. It is concluded that wind velocity is decisive in air for rooms on higher floors, but is negligible for basement and ground-floor rooms where inside-outside temperature is the determining factor. Naturally, these two factors overlap at intermediate heights.

8150 APTIC NUMBER 19564

Gladkiy, A. V., Ye. I. Surkov, and I. M. Shokin
MECHANISM OF DISSOLUTION OF SO2 IN SULFURIC ACID. (K mekhanizmu rastvoreniya SO2 v sernoy kislote). Text in Russian. Tr. Mosk. Khim. Tekhnol. Inst., no. 56:195-198, 1967. 4 refs.

Studies were made to determine the distribution of sulfur dioxide between sulfuric acid or water and an organic solvent (carbon tetrachloride, n-heptane) at 15C. For water and sulfuric acid in concentrations less than or equal to 0.1 N, the ratio expected from the distribution law is not observed, the dissolution of SO2 being accompanied by chemical reaction. With H2SO4 concentrations greater than 0.1 N, SO2 was found to dissolve without chemical reaction, substantiating earlier reports.

8151 APTIC NUMBER 19133

Greenberg, M. I. and J. P. Heicklen
REACTION OF O(1D) WITH N2O. Pennsylvania State Univ., University Park, Ionosphere Research Lab., NASA Grant NGL-39-009-003, Rept. 343, 12p., Nov. 15, 1969. 10 refs.
CFSTI: N70-11899

The reaction of singlet molecular oxygen produced from the photolysis of nitrous oxide at 2139 A reacts with N2O by the reaction O(1D) plus N2O yields N2 plus O2 and O(1D) plus N2O yields 2NO. The method of chemical differences was used to obtain an accurate measure of the ratio of reaction rates, k2/k3, equal to 1.12 plus or minus 0.02. The quantum yield of producing triplet oxygen, O(3P), either from direct photolysis or deactivation of O(1D) by N2O, is less than 0.02 and probably zero. (Author abstract modified)

8152 APTIC NUMBER 21934

Happel, John and Richard S. Atkins

RATE-CONTROLLING PATH FOR CATALYTIC BUTANE DEHYDROGENATION. Ind. Eng. Chem. Fundamentals, 9(1):11-14, Feb. 1970. 19 refs.

In an experimental study of the nature of the rate-controlling steps in the dehydrogenation of butane to butenes and the reverse hydrogenation reaction over a commercial chromia-alumina catalyst, runs were made in a differential continuous flow reactor containing 40 grams of pelleted catalyst. C(14)-tagged butane and 1-butene were used as tracers to follow independently the unidirectional rates, while the over-all reaction was simultaneously observed. The system was studied over a range of ratios of forward to reverse reaction rates from 0.02 to 10; an apparent stoichiometric number close to unity was observed. Chemisorption or desorption of hydrogen is not a rate-controlling step, or very high apparent stoichiometric numbers would have been observed using C(14) as a tracer. One or more rate-controlling steps exist in the elementary reactions involving transformation of the dehydrocarbon skeleton. (Author abstract)

8153 APTIC NUMBER 19494

Harstad, J. Bruce, Melvin P. Filler, William T. Hushen, and Herbert M. Decker
HOMOGENEOUS BACTERIAL AEROSOLS PRODUCED WITH A SPINNING-DISC GENERATOR. Appl. Microbiol., 20(1):94-97, July 1970. 10 refs.

Aerosols composed of viable particles of a uniform size were produced with a commercial spinning-disc generator from aqueous suspensions of Bacillus subtilis var.niger spores containing various amounts of an inert material, dextran, to regulate aerosol particle size. Aerosols composed of single naked spores having an equivalent spherical diameter of 0.87 micron were produced from spore suspensions without dextran, whereas aerosols produced from suspensions containing 0.001, 0.01, 0.1, and 1% dextran had median diameters of 0.90, 1.04, 1.80, and 3.62 micron, respectively. Such aerosols, both homogeneous and viable, would be useful for calibrating air sampling devices, evaluating air filter systems, or for employment wherever aerosol behavior may be size-dependent. (Author abstract modified)

8154 APTIC NUMBER 21732

Hartkamp, Heinrich
STOICHIOMETRIC STUDY OF THE REACTION BETWEEN GASEOUS NITROGEN DIOXIDE AND SALTZMAN REAGENT. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(11):6-12, Nov. 1969. 9 refs.

From preparative and analytical work and from spectrophotometric investigations, it has become evident that the reaction of Saltzman reagent with both nitrogen dioxide and nitrite ions results in the formation of the azo dye 1-(N-amino-ethyl)-amino-4-naphthyl-azobenzene-p-sulfonic acid. Reversible color changes indicate that the Saltzman dye is a pH-indicator and its light absorption is strongly dependent on the pH of the solution analyzed. The dye cation is present in the acidic region and the zwitterion near the neutral point,

while in the strongly alkaline region the dye anion is predominant. From the molecular extinction coefficient, the stoichiometric factor governing the reaction between Saltzman reagent and high diluted nitrogen dioxide has been derived. In agreement with other findings, but in contrast to the value reported by Saltzman, it has been found to be 1.

8155 APTIC NUMBER 19007

Haugen, G. R. and S. W. Benson
CHEMICAL ELECTROSTATICS. I. ELECTROSTATIC DESCRIPTION OF THE MARKOVNIKOV RULE. J. Phys. Chem., 74(7):1607-1622, April 2, 1970. 9 refs.

A critical evaluation of the applicability of electrostatic models in the intramolecular domina justifies the use of idealized electrostatic models, such as point dipoles and point aggregates of polarizable matter with field independent polarizabilities. The apparent inaccuracies in applying these idealized electrostatic models to explain molecular properties stem from the misapplication of these models in a region of enormously inhomogenous fields. The Markovnikov rule for addition to olefins can be stated as follows: the olefinic carbon atom that sustains a positive formal charge will be the one with the least number of attached hydrogen atoms. The enormous effect of alpha-methyl substitution on kinetics of four-center gas-phase reactions is a manifestation of this rule. This kinetic orientation phenomenon is quantitatively exhibited as a decrease in activation energy of about 5-6 kcal/mol upon the substitution of a methyl for an alpha hydrogen and 1-2 kcal/mol upon substitution of a methyl for a beta-hydrogen. In view of the fact that the kinetic data have been shown to be compatible with a very polar transition state, it is reasonable to idealize this transition state as a semiion quadrupole. The interaction between a point dipole and a dielectric sphere at molecular dimensions was derived and suggests that under these conditions the electrostatic center and the geometric center do not coincide. In the case of the carbon-hydrogen bond, the interaction energy is corrected by about 10%, while the carbon-carbon bond requires a correction of 100% in the interaction energy. Starting with these corrected idealized electrostatic models, an electrostatic description of the Markovnikov rule was developed, which utilizes the observed bond angles and distances, covalent radii of the atoms, macroscopic mean polarizabilities of the atoms, and molecular dielectric constant in the vicinity of the charged carbon atoms. The interactions of charged atoms with polarizable groups can be considered as idealized charge-dielectric sphere interactions. However, the polarizable matter in which the charge is embedded is treated as a continuous dielectric. The calculated stabilization energy of the positively charged carbon atom by a methyl group is 5.8 kcal/mol, while the negatively charged carbon atom is stabilized by 1.6 kcal/mol. (Author abstract modified)

8156 APTIC NUMBER 19036

Headley, L. C., C. I. Pierce, and W. K. Sawyer
FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE INFLUENCE OF AN ELECTRIC FIELD. Bureau of Mines, Washington, D. C., Rept. of Investigations 7342, 33p., Jan. 1970. 24 refs.

Exploratory tests were conducted to determine the effects of steady electric fields on fluid flow and streaming potential in narrow passages and porous media, the effects of steady electric field on fluid interfaces, and the influence of internal voltages on fluid flow in a porous porcelain sample. Photographs were made with an electronic-pulse camera, a high-speed motion picture camera, and an ordinary still camera, of droplets emerging and falling from flow streams of various fluids, including sodium chloride brine of different resistivities, polymer solutions, a urea solution, acetone, and a 50-50 oil-brine emulsion. Voltages greater than about 5 kilovolts influenced liquid droplets emanating from a capillary tube, and solutions of polyethylene oxide and polyacrylamide in water exhibited widely different behavior than that of other liquids tested. Liquid-liquid displacement tests in porous samples to determine the influence of high voltage applied to the displacing liquid on flow rates and recovery gave no significant differences. No consistently measurable effects were noted, either on flow rate or streaming potential, when an electric field was applied transverse to the direction of flow in porous media and in narrow rectangular or cylindrical channels. Experimental values of formation factor and streaming potential for a porous porcelain sample agreed qualitatively with those calculated from electrokinetic theory for ultrafine capillaries. However, the agreement for the electroviscous effect was not good. (Author abstract modified)

8157 APTIC NUMBER 19544

Heinsohn, Robert J. and Philip M. Becker
ELECTRICALLY AUGMENTED FLAME. Pennsylvania State Univ., University Park, Center for Air Environment Studies, NAPCA Grant AP-00643 and NSF Grant K7-0363K, Publ. 117-69, 70p., July 1969. 107 refs.

Current knowledge of the relationship between flame particles and an electric field is reviewed in detail, and past, present, and future engineering applications are summarized. The history of the study of this subject, which is recorded at least as early as 1600, is described, and the subjects of 'ionic wind' and origins of ions and kinetic mechanisms are considered at length. Seven types of engineering applications are discussed: electrically boosted flames, energy transfer from flames and flame temperatures, control of aerosols and flame carbon, control of laminar and turbulent diffusion flames, extinction limits, control of solid propellant burning, and noise generation and suppression. As a potential technique in air pollution control, electric fields may alter the production of pollutants by directly altering kinetics or by enabling a burner to operate efficiently under flow conditions which inherently produce minimally small pollution. Some recommendations for future research are made.

8158 APTIC NUMBER 19043

Hobdell, M. R. and L. Newman
ON THE INITIAL REACTION OF CARBON MONOXIDE WITH LIQUID SODIUM. Brookhaven National Lab., Upton, N. Y., 12p., Sept. 1969. 5 refs.

CFSTI: BNL 50197 (T-548)

Experiments on the initial reaction of carbon monoxide with liquid sodium attempted to find whether CO or sodium-CO compounds are sodium soluble. Absorption of CO equivalent to a few ppm in the metal could be detected. Three distinct reaction stages were evident: (1) an initial induction period, (2) a rapid uptake stage, and (3) a stage at which the uptake again became slow. The disappearance of surface films, the accompanying changes in the physical nature of the liquid sodium, and the distribution of the reaction product throughout the bulk metal, may indicate that a soluble species is involved.

8159 APTIC NUMBER 19063

Hornstein, Irwin and Roy Teranishi
THE CHEMISTRY OF FLAVOR. Chem. Eng. News, vol. 45:92-108, April 3, 1967. 8 refs.

The chemistry of flavor, as related to odor and taste, is discussed. It is generally agreed that there are four basic tastes: sweet, sour, salty, and bitter. Sour tasting compounds are generally acidic. An absolute correlation between taste and physical and chemical properties of salts has not been established, but, in general, low molecular weight salts are salty and, as the molecular weight increases, the taste shifts to bitter. No valid theory for predicting which substances will be sweet or bitter exists. There have been many attempts to correlate chemical structure and odor, but the results have been disappointing. Compounds with different structures may have similar odors, while compounds with similar structures may have different odors. The physiological mechanisms which generate olfactory and taste impulses are discussed. The low thresholds for odoriferous compounds and the low concentrations of these components in food make chemical analyses for flavor components difficult. Mass spectrometry is the most sensitive analytical method when used with gas-liquid partition chromatography. Despite the steadily increasing accumulation of factual information concerning the volatile compounds associated with flavor, no conclusions concerning the specific nature of flavor have been obtained.

8160 APTIC NUMBER 19617

Horvath, Zoltan
STUDY OF THE THERMODYNAMICS OF REACTIONS OCCURRING DURING THE DEAD ROASTING OF SPHALERITES AND PYRITES. (A szfalerit es pirit oxidalo porkolesenel lejatszodo reakciok termodinamikai vizsgalata). Text in Hungarian. Kohasz. Lapok, 10(4):163-176, 1955. 6 refs.

The thermodynamics of a number of metallurgical reactions are discussed: the reaction of zinc sulfide with atmospheric oxygen to form zinc oxide and sulfur dioxide; the oxidation of SO2 to SO3; the reaction of ZnO with SO3 to form ZnSO4; the pyrite roasting reaction, which is the decomposition of FeS2 to form FeS and S2; oxidation reactions which involve FeS and S2, yielding FeO, Fe2O3, Fe3O4, SO2, and SO3; various reactions between sulfur trioxide and the sulfides and oxides of iron; the oxidation of FeO to Fe2O3 and Fe3O4; the reaction between FeO and Fe2O3, forming Fe3O4; the oxidation of FeSO4 to Fe2(SO4)3 and Fe2O3; the decomposition of the latter two products to form sulfur trioxide and oxides of iron; the oxidation of FeS2 to form sulfur dioxide and oxides of iron.

8161 APTIC NUMBER 19392

Inaba, Tetsuo and Kazuo Kono
RESEARCH ON THE REACTION OF IRON SULFIDES. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), vol. 57:879-884, 1954. Translated from Japanese by Belov and Associates, Denver, Colo.

For the elimination of sulfide compounds in a gas for industrial basic materials, there are low temperature dry methods, wet methods, and high temperature dry methods. To eliminate organic sulfur compounds, the high temperature dry method must be used. Yellow ocher is packed in a container heated to 400-500 C, and the sulfur in the gas is catalytically fixed by the iron in the packing. Investigations were conducted on reclaiming the fixing agent, which loses its desulfurization ability in the form of packing. If a vapor is used with air, the temperature rise caused by the reaction heat is controlled, and good reclaiming results. When only vapor is used, the temperature must be above 700 C. The wet method of roasting pyrolotite was studied, and it was found that if the vapor is acted upon, almost complete desulfurization occurs. This process requires a temperature of 900 C. To recover a large amount of free sulfur, the flow velocity should be below 80 cm/min, and the grading should be about 150 units. From the thermodynamic point of view, the roasting of pyrolotite is not very advantageous, but if the installation and methodology are improved it may become a useful approach. (Author conclusions modified)

8162 APTIC NUMBER 12268

Johnston, Harold S.
GAS PHASE REACTION KINETICS OF NEUTRAL OXYGEN SPECIES. Natl. Bur. Std. (U. S.) Natl. Std. Reference Data Ser., no. 20, 49p., Sept. 1968. 131 refs.

Thermal, homogeneous reactions of O3, O2, and O are represented by a set of seven elementary chemical reactions: O2 + M yields O + O + M; O + O + M yields O2 + M; O3 + M yields O + O2 + M; O + O2 + M yields O3 + M; O + O3 yields O2 + O2; O2 + O2 yields O + O3; and O + O2 yields O2 + O (exchange). The experimental data obtained by many different investigations have been combined to obtain rate constants as a function of temperature for each of the first six elementary reactions and to obtain the rate constant of reaction 5 at room temperature. The recommended rate constants for the seven elementary reactions are (energies in the exponent are kilocalories/mole): kD(O2) equals 0.0000457/T exp (-118.7/RT) cu cm/particle/sec; kR(O2) equals 3.80 times 10 to the minus 30th power/T exp (-0.34/RT) cm to the 6th power/particle sq sec; kD(O2)/kD(Ar) equals 10.8 (and kR(O2)/kR(Ar) 10.8), T: 300 to 15,000 K for Ar as M, 1000 to 8000 K for O2 as M; k1(O3) equals 1.65 times 10 to the minus 9th power exp (-22.72/RT)

cu cm/particle/sec; k2(O3) equals 4.63 times 10 to the minus 35th power exp (2.20/RT) cm to the 6th power/particle sq sec; k3 equals 2.00 times 10 to the minus 11th power exp (-4.79/RT) cu cm/particle/sec; k4 equals 2.12 times 10 to the minus 11th power exp (-100.6RT) cu cm/particle/sec; k5 equals 1.7 times 10 to the minus 12th power cu cm/particle sec; T: 200 to 1000 K. Over the actual range of observations, the following estimates of the uncertainty in the logarithm of k are presented: log kD plus or minus 0.3, log kR plus or minus 0.3, log k1 plus or minus 0.1, log k2, log k3 plus or minus 0.2. (Author summary)

8163

APTIC NUMBER 19576

Kalland, A. S. and J. N. Pitts, Jr.
VAPOR-PHASE PHOTOOXIDATION OF DIETHYL KETONE. J. Am. Chem. Soc., 91(6):1269-1275, March 12, 1969. 21 refs. (Presented at the Am. Chem. Soc., 145th Natl. Meet., New York, 1963.)

The photooxidation of diethyl ketone has been studied in the temperature range 25-200 deg and over a range of oxygen partial pressures from 0 to 100 mm. The major initial products of this reaction were found to be acetaldehyde, carbon dioxide, carbon monoxide, and ethanol. Fairly large yields of methanol appeared to be formed through secondary reactions of acetaldehyde. A simple free-radical-chain reaction scheme is proposed to account for the formation of the major products in the initial stages of reaction. The only hydrocarbon product was found to be ethylene which was formed with low quantum yields. The effect of added inert gas suggests that this ethylene arises through decomposition of 'hot' ethyl peroxy radicals. (Author abstract)

8164

APTIC NUMBER 21864

Kasaoka, Shigeaki, Osamu Takeda, Riji Sasaoka, and Hitoshi Murao
ACTIVITY OF CUO-CR2O3-ZNO AND FE2O3-CR2O3 CATALYSTS FOR CARBON MONOXIDE SHIFT REACTION. (Issanka-tanso no tenka-hanno ni suchiiru kogyo-yo enchu-jo seikei-shokubai no kassei). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 73(1): 133-137, Jan. 1970. 9 refs.

A comparison on the activities of carbon monoxide conversion catalysts was performed between the high temperature catalyst (Fe2O3-Cr2O3) and low temperature catalyst (CuO-Cr2O3-ZnO) by the use of a hard glass tube with the internal diameter of 1.0 cm. The catalyst for low temperature was a cylindrical girdler G-66B with the diameter and length of 0.470 cm and 0.423 cm, respectively. Those for high temperature were also cylindrical catalyst; catalyst A had the diameter and length of 0.540 cm and 0.635 cm respectively, and catalyst B had the diameter and length of 0.293 cm and 0.549 or 0.327 cm, respectively. The conversion temperature for the girdler G-66, catalyst A and B were 135 to 200 plus or minus 2 C, 325 to 400 plus or minus 3 C and 300 to 400 plus or minus 3 C, respectively. The ratio of the partial pressures of H2O and CO(H2O/CO) was 4.0. The activities (the velocity value) of these catalysts were as follows: for G-66B; 2.85 times 10 to the 5th power exp (-20,600/RgT); for A, 1.51 times 10 to the 4th power exp (-26,700/RgT); and for B, 1.48 times 10 to the 4th power exp (-27,600/RgT), where Rg (cal/mol K) was the gas constant and T was the absolute temperature.

8165

APTIC NUMBER 19082

Kleemenko, A. P.
ONE FLOW CASCADE CYCLE (IN SCHEMES OF NATURAL GAS LIQUEFACTION AND SEPARATION). Preprint, Intern. Inst. of Refrigeration, Paris 5p., 1968. (Presented at the International Congress Refrigeration, 12th, Madrid, Aug. 30-Sept. 6, 1967. Paper 18/002.)

A one-flow cascade cycle was developed and investigated which is based on the assumption that an ideal heat-exchange process, characterized by a zero temperature difference, is theoretically possible only at a counter current, when equal alteration of heat exchange of coolant and consumer occur as a function of temperature. The cycle utilizes a multi-component mixture of hydrocarbons as the cooling agent, and the mixture composition and pressure are selected so as to satisfy the heat exchange at minimum temperature differences. Mounting and the construction of the one-flow cascade cycle are such that only throttling of the liquid phase is being carried out, which predetermines the high value of the coefficient of the thermodynamic reversibility of the process. The composition of cooling agent, pressure, temperature and position of condensate sampling required for optimum performance of the system were experimentally determined with a binary propane-methane mixture and a triple methane-propane-butane mixture. The cycle is applicable for methane separation, air liquefaction and separation, gas separation in cracking and pyrolysis, and in cold producing installations with parameters of -80 to -100 C.

8166

APTIC NUMBER 19611

Konashenok, V. N.
PHOTOCHEMICAL THEORY OF OZONE. (O fhotokhimicheskoy teorii ozona). Text in Russian. Fiz. Atm. i Okeana (Moscow), 4(7):797-799, 1968. 7 refs.

Because of difficulties in explaining atmospheric ozone concentrations on the basis of the five well-known reactions of photochemical theory in terms of reaction rate considerations, additional reactions are proposed which involve the following impurities: methane, nitrogen dioxide, sulfur dioxide, and nitric oxide. The proposed reactions replace the ozone consuming reaction O(3P) + O3 yields 2O2.

8167

APTIC NUMBER 12151

Kopa, Richard D., Blanche B. Hollander, Frederick H. Hollander, and Hiroshi Kimura
COMBUSTION TEMPERATURE, PRESSURE AND PRODUCTS AT CHEMICAL EQUILIBRIUM. California Univ., Los Angeles, Dept. of Engineering, R-64-1, 104p., April 1964. 37 refs.

The computation of the theoretical reaction products at chemical

equilibrium which result from the combustion process of hydrocarbon fuel in air was presented. A system of 18 nonlinear algebraic equations was developed for the computation of 18 reaction products. Results of the computation of the combustion at specified equilibrium temperatures and pressures were presented. For the computation of the equilibrium combustion temperature and pressure, the original set of 18 equations was enlarged by energy and mass balance equations and the procedure was applied to constant volume and constant combustion. Cases of combustion, including the effects of air-fuel ratio as well as the effect of water addition or exhaust gas addition to combustible mixtures, were computed and the results presented in charts. The charts were applied to the determination of the peak combustion temperature in an internal combustion engine. The procedure of transformation and coding of the equation system for solution on electronic computer was described. Part of the program was written in SWAC and part in FORTRAN. Tabulated values of enthalpy and equilibrium constants employed in the calculation, as well as literature references for other thermodynamic constants, were included. Samples of the computational results were presented. (Author abstract modified)

8168 APTIC NUMBER 19044

Kordes, Ernst, Wolfgang Bergmann and Werner Vogel
REDUCTION OF THE FREEZING POINT OF MOLTEN ELECTROLYTES BY ADDITION OF SALTS. I. (Die Gefrierpunktserniedrigung geschmolzener Elektrolyte bei Zusatz fremder Salze. I.). Text in German. Z. Electrochem., vol. 55:600-606, 1951. 10 refs.

If a foreign ion is dissolved in a molten electrolyte, only those ions will be able to reduce the freezing point which are not present in the solvent (molten electrolyte). Thus, reduction of the freezing point provides not only information on the molecular state of the dissolved substance but also on that of the solvent. The validity of Raoult's law was tested with molten AgNO3 and KSCN as solvents. The freezing point reduction of AgNO3 through addition of the following salts was measured: KNO3, Pb(NO3)2, HgCl2, HgBr2, HgJ2, Ag2SO4, KClO4, PbSO4, ZnSO4, PbCl2, K2Cr2O7, Ag2(HgJ4). Also, the freezing point reduction of KSCN by the following salts was measured: KBr, KJ, KNO3, KCN and AgSCN. The reduction in all cases corresponded to the number of foreign ions added, provided the dissolved substance was completely dissociated. It was found that this proportionality of the freezing point reduction with the molar concentration of the added salt was maintained up to surprisingly high concentrations, sometimes far beyond 10 mol-%.

8169 APTIC NUMBER 19020

Kos, V. M. and Yu. I. Sitnitskiy
THE QUESTION OF MEASURING AVERAGE VELOCITY RATE IN PIPES BY MEANS OF POINT-TYPE SENSORS. Kontrol. Izmeritel'naya Tekhn., no. 4:123-126, 1968. 3 refs. Translated from Russian by D. Koolbeck, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 6p., Sept. 18, 1969.
CFSTI, DDC: AD 700368

Assuming that the rates of flow are symmetrically distributed with respect to the pipe axis, the location of a layer is found in which the flow rate is equal to the average flow rate of the fluid in the pipe; the variation of this location with the varying average rate is investigated. Experimental curves of rate versus radius are shown. These curves are described by an exponential equation. Examination of this equation shows that the measurement of the average rate by a point-type sensor placed in the average-rate layer is much more accurate than the measurement of the maximum rate with subsequent rate correction. The theoretical error of measurement when the point sensor is displaced from its true average-layer position by 1% is 0.15%. However, the practical value of this error will be somewhat higher.

8170 APTIC NUMBER 19361

Kovar, Natalie S.
SUPPORT-STUDIES FOR THE CORONAGRAPH CONTAMINATION EXPERIMENT. Houston Univ., Tex., Dept. of Physics, Contract NAS 9-8869, 28p., Aug. 31, 1969. 1 ref.
CFSTI: N70-10043

Mie scattering functions were calculated for a mixture of particles having a range in alpha between 2 and 240 where alpha is 2pi times the ratio of particle size to wavelength of incident light. A previously existing computer program for the calculation of Mie scattering functions was revised, and computation was done for particles 15 A in radius and in the ultraviolet. Larger particles contributed little to the general background radiance, while the assumed particle distribtuion favored small particles. As the particle size was increased by a factor of 10, the increment in scattering angle has to be decreased by a corresponding factor of 10 resulting in amplification of computer time needed. At present, it requires about 50 minutes of 1108 time to compute the scattering function for a range of 2 to 240 in alpha. For the spacecraft contamination problem, scattering functions for spherical ice particles were calculated, ranging in size from 15 A to 1 cm with the wavelength range for incident light from 1000 A to 5300 A. When the index of refraction becomes complex, as it does for a wavelength of 1200 A, the scattering curve exhibits a substantially different behavior than when the index of refraction is real.

8171 APTIC NUMBER 19548

Krasna, Alvin I. and D. Rittenberg
THE INHIBITION OF HYDROGENASE BY NITRIC OXIDE. Proc. Natl. Acad. Sci. U. S., 40(4):225-227, April 15, 1954. 15 refs.

The enzyme hydrogenase is of particular interest because of the comparative simplicity of its substrate. In its activation of molecular hydrogen, hydrogenase simulates the action of active platinum catalysts. Evidence indicates that hydrogenase contains ferrous iron, that it forms with carbon monoxide an inactive complex, which is photochemically dissociated by light, and that it can be oxidized to a ferric analogue, which can form a complex with cyanide. In support of this view, evidence is presented

that hydrogenase combines with and is inhibited by nitric oxide. Iron compounds, both organic and inorganic, are known to form complexes with nitric oxide. The relation of hydrogenase to other iron-containing enzymes and to hemoglobin is discussed.

8172 APTIC NUMBER 19483

Kuczynski, W.
TEST OF A CATALYZER WITH A BASE OF CR2O3 FOR THE PRODUCTION OF SO3. (Essai de catalyseur a base de Cr2O3 pour la production du SO3). Text in French. Ann. Genie Chim., 1967:202-205. 25 refs. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.)

Based on previous investigations dealing with the modification of vanadium catalysts, Al2O3 was used as the support for chromic catalysts designed for the catalytic oxidation of SO2. The catalysts were prepared by coprecipitation from mixed solutions of chromium and aluminum nitrates. Conversions of about 80% were obtained with catalysts containing from 18-20% Cr2O3. Some suggestions are given concerning the use of promotors with catalysts, and it is noted that the activity of chromic catalysts can probably be regulated by controlling the amount of the promotor. (Author abstract modified)

8173 APTIC NUMBER 21729

Levey, Stanley and Oscar J. Malchus
STUDIES OF METABOLIC PRODUCTS IN EXPIRED AIR. I. METHANE. J. Lab. and Clin. Med., 62(2):247-254, Aug. 1963. 7 refs.

The concentration of methane in rebreathed oxygen was determined as a method of analyzing the breath for this gas, and also to ascertain whether any correlation exists between the methane levels in the breath and metabolic or gastrointestinal disturbances. By rebreathing in a bag of oxygen, many of the volatile compounds in the expired air can be collected by exchange. Gas chromatographic methods were used to determine methane levels in the rebreathed oxygen from normal persons, patients with constipation or fecal impaction, following surgery, those getting nothing by mouth and patients with liver disease. Methane was found in the expired gases of all those studied, and no difference in the methane content was noted that could be correlated with the clinical conditions of the patients. (Author abstract modified)

8174 APTIC NUMBER 19525

Levy, Arthur, Earl L. Merryman, and William T. Reid
MECHANISMS OF FORMATION OF SULFUR OXIDES IN COMBUSTION. Environ. Sci. Technol., 4(8):653-662, Aug. 1970. 53 refs.

The chemistry of sulfur oxidation processes is reviewed with respect to the kinetics and mechanisms of the various processes involved. Sulfur, hydrogen sulfide, carbon disulfide, and methyl mercaptan oxidation processes are examined. Detailed examination of the kinetics and mechanism of hydrogen sulfide oxidation is made based on slow reaction, fast (exposition) reaction, flash photolysis, and flame microstructure studies of hydrogen sulfide-oxygen systems. Special attention is given to the role of the lower oxides, SO, and S2O2 in developing the mechanisms of SO2 formation. The inhibiting effect of SO2 on a number of combustion processes and the homogeneous formation and depletion of SO3 in flames via the reaction of O atoms with SO2 and SO3 are also reviewed. (Author abstract)

8175 APTIC NUMBER 19114

Liu, Benjamin Y. H., Kenneth T. Whitby, and Henry H. S. Yu
DIFFUSION CHARGING OF AEROSOL PARTICLES AT LOW PRESSURES. J. Appl. Phys., 38(4):1592-1597, March 15, 1967. 15 refs.

The diffusion charging process was studied by exposing monodispersed aerosols of di-octyl phthalate to unipolar ions produced by a high-voltage corona discharge, then measuring the electrical mobility and charge of the aerosols in a straight-through, dynamic flow system. Experiments were performed at 0.0311 to 0.960 atm, while the ratio, a/lambda, of the particle radius to the mean free path of the ions was varied from 1.0 to 66. Within the limit of experimental accuracy, the particle charge was found to be independent of the ratio, a/lambda, and dependent only on the concentration of small ions in the charging region during the exposure time. An equation derived to explain the experimental results agrees with a theoretical equation that suggests a molecular weight for ions which is on the order of 16 times that of air, or 460. Thus, the ions used in the charging experiments were probably clusters of molecules produced in the corona discharge rather than simple ionized air molecules. The conclusion is consistent with the 1.1 sq cm/V sec measured mobility of the ions, which is considerably smaller than the mobility of simple ionized molecules.

8176 APTIC NUMBER 20161

Lloyd, Stewart J.
SOME QUALITY MEASUREMENTS. J. Phys. Chem., vol. 22:300-302, 1918. 5 refs.

Accurate solubility determinations were made and tabulated for the following systems: sulfur dioixde in benzol, nitrobenzol, toluol, o-nitrotoluol, and acetic anhydride; aluminum chloride in carbon tetrachloride and chloroform; barium chloride in nitrobenzol; and acid in ethyl acetate. The SO2 determinations were made by bubbling the gas through the solvent until equilibrium was reached. The gas was generated by running concentrated H2SO4 and a saturated aqueous solution of sodium bisulfite into a Wolff bottle from separate dropping funnels. The organic liquids used for the determinations were distilled, dried over CaCl2, and redistilled just before using. Barometric pressure was kept between 756 and 760 mm.

8177 APTIC NUMBER 19570

Likhanova, T. L., and Ya. Ye. Vil'nyanskiy
SOLUBILITY OF CERTAIN GASES IN METAL CHLORIDE MELTS. (Rastvorimost' nekotorykh gazov v rasplave khloridov metallov). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii Khim. i. Khim. Tekhnol., 9(4):537-540, 1966. 8 refs.

Solubilities of chlorine, hydrogen chloride, carbon monoxide, and carbon dioxide in molten anhydrous carnallite were studied from 500-900 C with gas partial pressures of 0.30-1.02 atm. Solubility of chlorine and carbon dioxide was found to be approximately equal to the partial pressure raised to some temperature-dependent power, times an empirical constant. Solubility of hydrogen chloride and carbon monoxide was found to follow the Henry law. Solubility increases with temperature for chlorine, carbon monoxide, and carbon disulfide, but decreases for hydrogen chloride. Heat of solubility in the anhydrous carnallite melt of the 500-900 C range is (cal/mole): Cl2, 3640; CO2, 3700; CO, 6560.

8178 APTIC NUMBER 17274

Lunev, N. K. and M. T. Rusov
ON THE MECHANISM OF ALCOHOL FORMATION IN THE HYDROGENATION OF CARBON MONOXIDE OVER A PROMOTED ZINC-CHROMIUM CATALYST. (O mekhanizme obrazovaniya spirtov pri gidrirovanii okisi ugleroda na promotirovannom tsinkkhromovom katalizatore). Text in Russian. Kinetika i Kataliz, 10(5):1052-1056, 1969. 14 refs.

A possible formation mechanism for C1-C4 alcohols in the hydrogenation of carbon monoxide over ZnO.ZnCr2O4 promoted with 1.48 wt % potassium carbonate is examined. It has been established that growth of the carbon chain is accomplished through dehydrogenation condensation of oxygen-bearing complexes. It is proposed that C2-C4 alcohols are formed by a sequential mechanism; the limiting step in the formation of methanol is the activation of hydrogen. Promoting the catalyst with palladium increases the activity and selectivity of the process with respect to methanol and reduces these characteristics with respect to alcohols higher than C1.

8179 APTIC NUMBER 19310

Macfarlane, J. J.
CARBON FORMATION IN PREMIXED METHANE-OXYGEN FLAMES UNDER CONSTANT-VOLUME CONDITIONS. Combust. Flame, 14(1):67-72, Feb. 1970. 16 refs.

The combustion of rich methane-oxygen mixtures under constant-volume conditions and from 30-70 atm is described. Experiments were made in a calorimeter bomb, which permitted the heat of the reaction to be measured directly while the combustion products were analyzed gravimetrically. From measurements of heat release and combustion product composition, it is shown that there is a threshold mixture strength for carbon formation, which occurs at a considerably weaker equivalence ratio than that which would be suggested by equilibrium calculations. Calculated maximum flame temperatures are in good agreement with the equilibrium values for the mixtures weaker than the soot formation threshold. The heat release per atom of oxygen shows a minimum value at the soot formation threshold and increases again at richer mixtures. Maximum flame temperatures under these latter conditions are in excess of equilibrium. The amount of carbon formed decreases at conditions approaching rich extinction. (Author conclusions modified)

8180 APTIC NUMBER 19429

Maudit, Y. de
LIQUID-VAPOR EQUILIBRIUM SO2-SO3. (L'equilibre liquide-vapeur SO2-SO3. Ann. Genie Chim., 1967:70-72. 3 refs. (Presented to the Congr. Intern. du Soufre, Toulouse, 1967.)

Dynamic ebulliometry was applied to a study of the liquid-vapor equilibrium of the binary mixture SO2/SO3 at pressures between 650 and 950 mm of mercury. The products used were extremely hygroscopic. To ensure operation of the ebulliometer at low temperatures, the feed and phase reception devices were redesigned. Two complete graphs of equilibrium were obtained which reveal an unusual feature for the composition of 66.6% SO3 and show that the compound defined as SO2-2SO3 is present in the dissociated state in liquid and vapor phases. Comparison of the two isobars shows that the stability of the compound depends on temperature and pressure. Further studies revealed that the compound is highly unstable, that its formation appears to be irreversible, and that conditions necessary for its stability require its presence in the solid state. (Author abstract modified)

8181 APTIC NUMBER 19224

Meyer, J. A., D. W. Setser, and D. H. Stedman
ENERGY TRANSFER REACTIONS OF N2(A CUBED SIGMA-SUB-U PLUS). II. QUENCHING AND EMISSION BY OXYGEN AND NITROGEN ATOMS. J. Phys. Chem., 74(10):2238-2240, May 14, 1970. 21 refs.

A series of experiments and theoretical analyses was performed to evaluate the quenching of N2(A cubed Sigma-sub-u Plus) by atomic oxygen and atomic nitrogen as energy transfer reactions and to observe and evaluate any resulting emissions. Conclusive evidence for the hypothesized quenching reactions by both atomic nitrogen and atomic oxygen was obtained and reaction rates were established for both reactions. The question of whether the reaction established for atomic nitrogen quenching is an energy transfer step or an atom exchange reaction and whether it is the only channel for N atom quenching of N2(A cubed Sigma-sub-u Plus) still remain unanswered. On the basis of available evidence, an energy transfer collision is the most plausible mechanism for the reaction.

8182 APTIC NUMBER 21817

Meyer, J. A., D. W. Setser, and D. H. Stedman
EXCITATION OF THE AUROPAL GREEN LINE OF ATOMIC OXYGEN (1S YIELDS

1D) BY N2 (A3SIGMA(+)U). Astrophys. J., vol. 152, 6p., Aug. 1969. 17 refs.

Collisions of N2 (A3Sigma(+)u) with oxygen atoms produce (01S) atoms. Experiments were performed in an apparatus which coupled two discharge-flows system together just upstream of a quartz emission window. One system produced ground-state oxygen atoms and the other, N2 (A3Sigma(+)u). The oxygen atoms were produced by discharging molecular nitrogen and titrating the resultant nitrogen atoms with nitric oxide. The other system employed collisions of molecular nitrogen with argon metastable atoms. The addition of oxygen atoms to N2 and NO linearly increased the 5577 A line of atomic oxygen. A similar correlation was found between 5577 A and concentrations of O(3p) atoms, demonstrating that the excitation of O(1S) is by the reaction O(3p) + N2 (A3Sigma(+)u) yields O(1S) + N2 (X1Sigma(+)g). The rate constant for the removal of N2(A) by oxygen is 3.2 times 10 to the minus 12th power.

8183 APTIC NUMBER 19917

Myers, G. H., W. C. Hanley, and B. A. Zilles
ESR SPECTRA OF NO2 IN INERT MATRICES. J. Chem. Phys., 53(3): 1181-1184, Aug. 1, 1970. 13 refs.

The electron spin resonance (ESR) spectrum of nitrogen dioxide in neon at 4 K is re-examined at improved resolution. The spectrum is interpreted in terms of three distinct sites: a rigid site with preferred molecular orientation as observed by Kasai; a rotational site with motion of the nitrogen atom about the O-O axis (which is oriented parallel to the matrix deposition surface); and a hindered rotation about the C sub 2V symmetry axis. Relative concentrations of these sites are estimated to be of the same order of magnitude. The NO2/argon spectra are irreversibly changed by annealing at 30 K, populating the latter rotational site at the expense of the former sites. (Author abstract modified)

8184 APTIC NUMBER 21849

Nagel, Ronald L., Helen M. Ranney, and Lidija L. Kucinskis
TYROSINE IONIZATION IN HUMAN CARBON MONOXIDE AND DEOXYHEMOGLOBINS. Biochemistry, 5(6):1934-1942, June 1966. 30 refs.

Ionization of the tyrosine residues in human hemoglobin variants in the carbon monoxide and deoxy forms was studied by spectrophotometric titration at 245 millimicrons. The existence of eight residues with 'normal' pK (10.6), and four 'abnormal' residues with higher pK, was confirmed. Hemoglobin F, which has no tyrosine in the non-alpha chain, has two fewer 'normal' tyrosine residues than did hemoglobin A. In hemoglobin H, after the interference of cysteine was eliminated, eight 'normal' and four 'abnormal' residues were observed. Two fewer 'normal' residues were identified in hemoglobin A treated with carboxypeptidase A. The findings suggest that in human hemoglobin, tyrosine residues beta 145 and beta 130 are 'normal', while beta 35 is 'abnormal'. Titration on deoxyhemoglobins A and F showed two fewer 'normal' residues than were seen in the corresponding CO hemoglobins. Such changes in ionization of the phenolic groups on deoxygenation were not observed in titration of hemoglobins H or A treated with carboxypeptidase A; both of these hemoglobins lack heme-heme interactions. Two tyrosine residues are suggested to undergo environmental changes with deoxygenation; indirect evidence supports the idea that the residue with altered environment on reaction of hemoglobin with oxygen is beta 145. (Author abstract modified)

8185 APTIC NUMBER 19912

Nelson, L. Y. and H. P. Broida
SO2 INFRARED FLUORESCENCE. J. Chem. Phys., vol. 53:1283-1284, 1970. 5 refs.

Infrared emission was observed from sulfur dioxide at 7.4 and 8.7 micrometers when ground-state SO2 molecules collided with a flowing stream of discharged nitrogen. The florescence spectra obtained with a 0.75-m monochromator, equipped with a 75-line/mm grating blazed at 10 micrometers and a Ge:Cu detector operating at 4 K, are shown. The SO2 was premixed with the active nitrogen 3 cm before entry into an emission cell 37 cm long and 5 cm in diameter. A 2450-MHz microwave discharge excited the nitrogen 27 cm from the point where SO2 was added. The optimum SO2 pressure ranged from 2 to 6 torr. Nitrogen pressures exceeded SO2, but not by more than a factor of 2, and were in the range of 2-10 torr. The emission band at 7.4 micrometers is assigned to the (001) to (000) transition. Inserting an SO2 gas cell should only attenuate the spectrum of (001), but it is shown that the overall band shape changes. This descrepancy is attributed to a reduction by the gas cell of atmospheric water absorptions centered at 1395, 1387, 1374, 1363, and 1339 cm. Emissions at 8.7 micrometers is due to the (100) to (000) transition since the band center falls at 1151 cm. Also, the band shape is not altered by the SO2 gas cell, which only reduces its overall intensity.

8186 APTIC NUMBER 19167

Noyes, W. Albert, Jr. and Charles S. Burton
PRIMARY PHOTOCHEMICAL PROCESSES IN SOME SIMPLE AROMATIC MOLECULES. Z. Elektrochem., 72(2):146-150, 1968. 29 refs. (Presented to the Intern. Conf. Photochemistry, Munich, 1967.)

The theoretical aspects of the absorption of photons in a simple molecular system, resulting in light emission, chemical reaction, and/or degradation of absorbed energy to thermal energy, are developed. Published data for benzene, hexafluorobenzene, fluorobenzene, toluene, o-xylene, and pyridine are briefly summarized and critically examined. There are marked uncertainties in the fractions of absorbing molecules which cross over to triplet states and doubt is expressed about the validity of existing methods. The importance of the vibrational level formed in the absorption act is emphasized since some processes such as isomerization appear to be competitive with vibrational relaxation even at moderate pressures. In the case of o-xylene existing data does not permit a decision to be made as to whether isomerization to m- and p-xylene occurs through the

singlet or through the triplet state. Isomerization of some of these simple aromatic molecules occurs, more at short wave lengths than at long. Final determination of whether these processes occur from the singlet or from the triplet state await further and better experimental data. (Author abstract modified)

8187 APTIC NUMBER 19906

Otsuka, Shoji, Kazue Fujivara, Hisayasu Ikawa, and Kiyoshi Hirayama
STUDIES ON CARBON MONOXIDE CONTENT IN CIGARETTE SMOKE.
Tababoenchu no CO ganyuryo ni tsuite). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 16(3):150-153, June 1970. 7 refs.

In order to determine the amount of carbon monoxide (CO) in cigarette smoke, a simple and expedient device was developed that would dilute cigarette smoke fifty times and determine the CO content by the test tube detector using Kitagawa's method (colorimetry). The values obtained were very close to those of Humpover and others who had employed gas chromatography in order to estimate the CO content. Since they have shown that the moisture content of cigarettes have little or no effect on the evaluation of CO content, the relationship between CO and factors such as other hydrocarbons and compounds contained in cigarettes and the condition of smoke intake (draw) was investigated. Of the ten domestic brands of cigarettes tested, in general, regular cigarettes yielded more CO than filtered cigarettes. By drawing in the smoke lightly, the CO content can be held down to about half of the CO resulting from a heavy draw. Apparently due to the condensation of nicotine and tar, differences were observed between the initial draws and the final draws.

8188 APTIC NUMBER 21750

Person, J. C. and P. P. Nicole
TABLES OF ABSORPTION CROSS SECTIONS, PHOTOIONIZATION YIELDS, AND PHOTOIONIZATION CROSS SECTIONS FOR SEVERAL GASES. In: Radiological Physics Division Annual Report July 1968 Through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 218-224, 1969.
CFSTI: ANL-7615

Tables of absorption cross sections, photoionization yields, and photoionization cross sections are presented for acetylene, propyne, propene, methanol, ethanol, and methyl bromide, and also for the perdeuterated analogues of these gases. For each gas, the data are reported for energies ranging from a value below the ionization potential up to 11.7eV. (Author abstract)

8189 APTIC NUMBER 19273

Pich, J.
A NOTE ON THE DIFFUSIVE DEPOSITION OF AEROSOLS ON A CYLINDER.
Aerosol Sci., 1(1):17-19, 1970. 18 refs.

The deposition of aerosol particles from a gas flow on obstacles of different shape is expressed by the deposition efficiency. This term is defined as the ratio of the number of particles which actually collide with the obstacle to the number which would have encountered it if they had moved all the time in straight lines. This definition is also used for other mechanisms, for instance diffusion. In this sense, deposition efficiency of a cylinder placed perpendicular to the gas flow can be defined by an equation based on the number of particles deposited in unit time on unit length of the cylinder, the number concentration of the aerosol, the radius of the cylinder, and the velocity of flow far from the cylinder. A mathematical analysis of this equation is given.

8190 APTIC NUMBER 17921

Seppe, Walter, August Spaeth, and Hans Krzikalla
METHOD FOR THE PRODUCTION OF ORGANIC SULFUR COMPOUNDS. (Verfahren zur Herstellung von organischen Schwefelverbindungen). Text in German. Farbenindustrie (I. G.) A. G., Frankfurt, Germany, W. German Pat. 742, 741. 2p., Oct. 27, 1939. 1 ref. (1 claim).

For producing organic sulfur compounds by conversion of hydrocarbons or halogen containing hydrocarbons with a halogen and sulfur dioxide in the presence of catalysts, it is advantageous to use those halides as catalysts which favor the halogenation to carbon. The following halides can be used: the chlorides of iron, copper, nickel, tin, titanium, zirconium, bismuth, boron, antimony; phosphorus iodide; and the halogen compounds as sulfur. Saturated paraffins such as cetan can be used for hydrocarbons, those obtained at the catalytic hydrogenation of the oxides of carbon at normal or increased pressure, those which arise at the separation of water from oxygen containing products of the catalytic hydrogenation of the oxides of carbon and hydrogenated, or polymerized olefins. The temperature of the process should not exceed 50 C.

8191 APTIC NUMBER 19045

Bienaecker, Guenther
STUDY OF THE ACTIVATING ENERGY IN HETEROGENEOUS CATALYSIS. (Ueber die Aktivierungsenergie in der Heterogenen Katalyse). Text in German. Z. Electrochem., 46(6):369-373, 1940. 19 refs.

To study the influence of dispersion on activation energy, pulverized bismuth with grain sizes of less than 0.5 mm, 1 mm and more than 2 mm, as well as single crystal wafers, were used for the dissociation of formic acid. Activating energy was lower with disperse material than with compact material. The catalytic properties of nickel sheets were also studied, and rolled, hard metal sheets displayed higher activity and activation energy or the HCOOH dissociation than soft, annealed sheets. Comparison of the activation energy of HCOOH dissociation and ethylene hydration in the presence of Cu, Ag, Au, Ni, Pd, and Pt catalysts revealed that those metals known as good hydration catalysts also show high energy interactions between catalyst and substrate and vice versa. The same is true for dehydration.

8192 APTIC NUMBER 19904

Robertson, Stanley L. and Stanley E. Babb, Jr.
ISOTHERMS OF CARBON MONOXIDE TO 10 KBAR AND 300 C. J. Chem. Phys., 53(3):1094-1097, Aug. 1, 1970. 9 refs.

The isotherms of carbon monoxide were determined between 35 and 300 C at pressures from 1500 to 10,000 bar. Upon attempting to determine the higher-temperature isotherms, gas loss was encountered which could not be traced to leakage, but was presumably due to the formation of nickel carbonyl. The various reaction products appeared to be both corrosive and hygroscopic, and were exceedingly difficult to clean out of the apparatus. Fiducial densities were taken from previous work by multiple-point Lagrangian interpolation of their virial coefficients. The use of 304 stainless steel for the material of the constant volume chamber necessitated a determination of its compressibility as a function of temperature, as well as its thermal expansion, in order to correct the chamber's volume to pressure and temperature values different from room conditions. An eight-term virial expansion was used to represent the data. One disturbing feature was the appearance for the first time of systematic differences between the volume changes used for fiducial fit and the volume changes predicted by virial expansion. The difference in density between nitrogen and carbon monoxide is presented graphically. At the high densities and low temperatures, the isochoric lines for nitrogen and for carbon monoxide appear coincident, but as the temperature is raised the isochoric line for nitrogen moves to higher temperatures than does that of carbon monoxide, the separation being almost 100 C at 525 isochors.

8193 APTIC NUMBER 19188

Russell, Edward John and Norman Smith
THE COMBINATION OF SULPHUR DIOXIDE AND OXYGEN. J. Chem. Soc., Vol. 77:380-352, 1900.

In the separation of sulfur dioxide and oxygen with a pellet of manganese dioxide, part of the SO2 combines with oxygen in a manner suggesting surface action in the cold on the part of the manganese dioxide, rather than at the high temperatures at which such combinations have been known to occur. Experiments were performed on the action of SO2 on oxygen in the presence of moist oxides, with dried substances, and in the presence of heated platinum. When a mixture of SO2 and oxygen is allowed to stand over certain metallic oxides at the ordinary temperature, combination takes place to a certain extent between the two gases, owing to the 'surface action' exerted by the metallic oxide. With the same oxide, the amount of SO3 formed depends on the extent of the surface of the oxide and on the state of the surface. The amount appears to be absolutely dependent on a simultaneous combination of the oxide with SO2 and in fact seems to proceed concurrently with this. The most striking instance of this surface action is afforded by manganese peroxide, some 20% of the SO2 being converted into SO3. When SO2 and oxygen are passed over heated platinised pumice, combination diminishes as the materials are more completely dried, and can be made very small. Hitherto it has been generally held that the 'contact action' of platinum could bring about combination even in the absence of any impurity, but this does not appear to be the case in the present instance.

(Author conclusions modified)

8194 APTIC NUMBER 19823

Sano, Isamu, Tomoyuki, Tokida, and Yasuo Ueno
FORMATION OF LEAD AEROSOLS IN NITROGEN AND THEIR CHEMICAL REACTIVITY. (Chissochu ni okeru namari ensutai no seisei to sono hannosei ni kansuru ichijikken). Text in Japanese. Funtai Kogaku Kenkyu Daishi (J. Soc. Assoc. Powder Technol., Japan), 7(2):91-97, April 1970. 7 refs.

With nitrogen gas as the medium, lead aerosols were generated in order to investigate the conditions under which monodisperse aerosols can be formed. The weight concentration and the particle size vary with the temperatures at which lead vapors arise (950-1150 C) and with the flow rate of nitrogen gas (1.0-4.5 liter/min). At constant temperature, the concentration and the particle size pass through a maximum with the increase in flow rate whereas the particle concentration passes through a minimum. At constant flow rate of nitrogen, there is a linear relationship between the logarithm of the particle size and the inverse of the temperature. Aerosols of high monodisperity can be obtained by setting the flow rate at around 1.5 liters/min in the range of 1000-1100 C. In the preliminary experiment concerning the reaction between iodine vapor and lead aerosols toward the formation of lead iodide, the reactivity was higher for coarser particles and affected by temperature to the extent of about 2% and 16% per 15 min at 40 and 50 C, respectively. The heat of activation was calculated to be about 21 kcal/mol.

8195 APTIC NUMBER 21876

Saronova, I. S., N. P. Keyer, T. P. Khokhlova, and I. L. Mikhailova
ON THE IMPORTANCE OF LOCAL AND COLLECTIVE ELECTRONIC PROPERTIES OF MODIFIED TIO2 IN THE OXIDATION OF CARBON MONOXIDE AND IN THE DECOMPOSITION OF ISOPROPYL ALCOHOL AND FORMIC ACID. (O znachenii lokal'nykh i kollektivnykh elektronnykh svoystv modifitsirovannoi TiO2 v reaktsiyakh okisleniya izopropilovogo spirta i muravinoi kisloty). Text in Russian. Kinetika i Kataliz, 11(2):447-450, 1970. 18 refs.

Catalytic properties of titanium dioxide samples differing in surface and volume electric properties were studied in dehydration of isopropyl alcohol and formic acid in a flow-through apparatus. Electric properties of TiO2 were varied by introducing W(+6) and Fe(+3) cations into the TiO2 lattice in various amounts. The WO3 addition shifted the selectivity of the reaction completely in the dehydration direction, while introduction of Fe2O3 into TiO2 lattice enhanced its dehydrogenation properties. Upon addition of both, Fe2O3 weakened the effect of WO3 on the catalytic properties of TiO2. The observed changes of catalytic properties in described dehydration processes are connected with the change in electronic structure of the catalyst surface and volume. An electronic mechanism of dehydration is proposed. The selectivity of the decompositon process accordingly depends on the ratio of oppositely charged forms of alcohol and acid (donor and acceptor forms) on the surface of the catalyst, which is

determined by the collective electronic properties of the catalyst. In the case of catalyst modification by additives, the stronger and opposite-sign change of the local properties can completely overlap, the effect of collective properties of the catalyst surface. Catalytic oxidation of CO on TiO2 and its solid solutions was studied at 300-400 deg in a static apparatus. The effect of local changes of the surface was negligible and the activation energy of the process is determined by collective electronic properties.

8196 APTIC NUMBER 21971

Scott, W. D. and J. L. McCarthy
THE SYSTEM SULFUR DIOXIDE-AMMONIA-WATER AT 25 DEG. C. Ind. Eng. Chem., 6(1):40-48, Feb. 1967. 29 refs.

In spite of the industrial importance of the sulfur dioxide-ammonia-water system in connection with the ammonium sulfite paper pulping process, little basic work has been done in recent years to credit claims that sulfurous acid and ammonium hydroxide do not exist and that the sulfur pentoxide ion is an important constituent. No complete analysis has been made without assuming ideal solutions. This work uses modified standard procedures to obtain infrared absorption spectra, pH measurements, and electrical conductivity measurements for solutions over the entire range of mole ratios of ammonia to sulfur dioxide. The results indicate that only the species hydrogen (+), hydroxide (-), sulfurous radical (-), sulfur trioxide (-), ammonium (+), a solvated form of sulfur dioxide, and a solvated form of ammonia exist in the solutions in significant amounts. Negligibility considerations combined with a theoretical treatment allow calibrations of species concentrations for solutions of pH less than 7.0. The treatment is rigorous and requires no assumptions about ideal solutions. (Author abstract)

8197 APTIC NUMBER 19613

Shifrin, K. S. and V. A. Punina
INDICATRIX OF SCATTERING OF LIGHT IN THE REGION OF SMALL ANGLES. (Ob indikatrise rasseyaniya sveta v oblasti malykh uglov). Text in Russian. Fiz. Atm. i Okeana (Moscow), 4(7):784-791, 1968. 5 refs.

An indicatrix is derived for the scattering of light at small angles from large particles, and its application to the method of small angles is demonstrated, permitting the determination of particle distribution. The method is then extended to embrace fine particles.

8198 APTIC NUMBER 21814

Sinard, A. J. and J. M. Valenzuela
A COMPUTER PROGRAM TO ANALYSE DIFFERENCES IN SIMULTANEOUS WIND SPEED AND DIRECTION MEASUREMENTS AT SEVERAL STATIONS. Forest Fire Research Inst., Ottawa (Ontario), Dept. of Fisheries and Forestry, Rept. FF-X-18, 33p., April 1969. 3 refs.

A computer program which provides the basic data necessary for adjusting wind speeds from a number of stations to a standard value is discussed. The program allows for the preparation of valid area fire danger forecasts. It also enables two or more stations to be compared with each other to determine their similarities and differences with respect to wind speed and direction measurements. (Author conclusion)

8199 APTIC NUMBER 19910

Sinecek, A.
THE ADDITION EFFECT OF SODIUM OXIDE AND MANGANESE DIOXIDE ON THE ACTIVITY OF A VANADIUM CATALYST FOR SULFUR DIOXIDE OXIDATION. J. Catalysis, 18(1):83-89, 1970. 28 refs.

The results of experiments on catalytically increasing reaction rates for sulfur dioxide oxidation are discussed. Kinetic measurements, carried out over a wide temperature range, show that the addition of sodium oxide to the standard vanadium catalyst results in an increase of catalyst activity at temperatures below 430 C, while at higher temperatures it causes a decrease. The apparent activation energy by the addition of 7% by weight sodium oxide decreases from 61 to 33 kcal/mole. This decrease is attributed to the influence of sodium oxide on the rate of the rate-determining step. By addition of more than 1% of manganese dioxide the activity of the catalyst decreases. Background activity on several highly active industrial vanadium catalysts at low temperatures is given. (Author abstract modified)

8200 APTIC NUMBER 11938

Simpson, Maurice H.
RESEARCH ON THE EFFECTS OF TEMPERATURE AND HUMIDITY ON OZONE CONCENTRATIONS. Frankford Arsenal, Philadelphia, Pa., Quality Assurance Directorate, AMCMS 5027.11.701, Proj. 1A025001A622.19, Rept. R-1754, 34p., April 1965. 18 refs.
DDC: AD 464780

Investigations were carried out in a laboratory ozone test facility to determine if humidity has any effect on the decomposition rate of ozone at normal atmospheric temperatures and pressures and, if so, to develop relationships that would describe that effect. Specifications of the ozone test cabinet are given. A constant ozone generation rate was maintained while controlling temperature at 50, 70, 80, and 100 F and controlling humidity at specific dewpoint temperatures from 0 F to 65 F. Ozone concentrations were not significantly affected by atmospheric temperatures within the environment of the troposphere, but were affected by the relative amount of moisture present. An increase in humidity will cause a decrease in ozone concentration; an equation is given for approximately this relationship. The results are related to the design of future laboratory ozone test facilities, and recommendations for future research are made. An appendix includes a review of the literature on temperature and humidity effects on ozone, and a presentation of experimental data from the present experiments.

8201

APTIC NUMBER 21799

Sklyarov, A. V., I. I. Tret'yakov, B. S. Shub, and S. Z. Roginskii
OXIDATION OF CARBON MONOXIDE BY OXYGEN ON PLATINUM PURIFIED IN ULTRAHIGH VACUUM. Soviet Phys. 'Doklady' (English translation from Russian of: Dokl. Akad. Nauk SSSR), 189(4-6):829-832, Dec. 1969. 14 refs.

The kinetics of the oxidation of carbon monoxide by oxygen on platinum were studied in a static vacuum apparatus at 175-1000 C and 10 to the minus 6th power to 10 to the minus 2nd power torr. The catalyst used was a thread of spectrally pure platinum suspended in the reactor on molybdenum leads. The reacting gases were supplied by diffusion. The reaction rate for stoichiometric mixtures changed from zero at 205 C to one at 400 C. For small excesses of O2, the maximum reaction rate moved in the direction of smaller excesses for higher temperatures. For constant temperature and initial CO pressure, with an increase in the initial O2 excess, the maximum reaction rate shifted in the direction of smaller amounts of conversion and the magnitude of the maximum rate increased. For large excesses of O2 and CO, the reaction was first order. The results are satisfactorily described by kinetic equations which assume that chemisorbed atomic and molecular oxygen interact with carbon monoxide in the gas phase and that the chemisorbed carbon monoxide does not react with oxygen but instead blocks part of the surface.

8202

APTIC NUMBER 19161

Smith, Roger P.
THE NITRITE METHEMOGLOBIN COMPLEX--ITS SIGNIFICANCE IN METHEMOGLOBIN ANALYSES AND ITS POSSIBLE ROLE IN METHEMOGLOBINEMIA. Biochem. Pharmacol., vol. 16:1655-1668, 1967. 20 refs.

When mice are given nitrite to induce methemoglobin, the effect has an unusual endurance compared with that produced by potassium ferricyanide, for instance. This is attributed to the formation of a reversible complex between excess free nitrite ion and the ferric heme groups of the methemoglobin. Absorption of methemoglobin in the range 600-650 millimicrons is evidence of the formation of this complex and is the source of errors in the estimation of methemoglobin levels, which can be corrected by washing the red cell suspensions. Attempts to estimate the dissociation constant of an ion strength corresponding to physiological conditions was not altogether successful, although its value is not thought to exceed 3 mM. It would thus be possible for the complex to exist in vivo in mice when sufficient nitrite is administrated to convert one-third of the hemoglobin to methemoglobin, but this is virtually impossible to demonstrate experimentally.

8203

APTIC NUMBER 21898

Solly, Richard K. and Sidney W. Benson
CARBON-HYDROGEN BOND STRENGTHS IN METHYL FORMATE AND THE KINETICS OF THE REACTION WITH IODINE. Intern. J. Chem. Kinet., vol. 1:427-437, Sept. 1969. 18 refs.

The gas phase reaction I2 plus HCOOCH3 yields HI plus CH3I plus CO2 was studied spectrophotometrically in a static system over the pressure ranges I2(6-39 torr) and HCOOMe (28-360 torr). In the temperature range 293-356 C, the initial rate of disappearance of iodine is first order in (HCOOMe) and half-order in (I2). The rate determining step is I plus HCOOMe yields HI plus COOMe where k sub-1 is given by log to the base 10 (k sub-1/reciprocal M sec) equals (9.6 plus or minus 0.3) minus (22.4 plus or minus 0.8)/theta where theta equals 2.303 RT in kcal/mole. This activation energy gives a carbonyl C-H bond strength of 92.7 kcal/mole. At 356 C, there was no evidence of abstraction of a methoxy hydrogen, so a lower limit of 1PP kcal/mole may be placed on this C-H bond strength. These ester C-H bond strengths are discussed in relation to comparable values in aldehydes and ethers. (Author abstract modified).

8204

APTIC NUMBER 21966

Solly, R. K., D. M. Golden, and S. W. Benson
KINETICS OF THE GAS-PHASE REACTION OF ACETONE WITH IODINE: HEAT OF FORMATION AND STABILIZATION ENERGY OF THE ACETONYL RADICAL. Intern. J. Chem. Kinet., vol. 2:11-21, 1970. 19 refs.

The kinetics of the reversible gas-phase reaction CH3COCH3 plus I2 yields CH3COCH2I plus HI were measured spectrophotometrically in a static system over the temperature range 340-430 C. The pressure of CH3COCH3 was varied from 15 to 330 torr and of I2 from 4 to 48 torr, and the initial rate of the reaction was consistant with CH3COCH3 plus I yields with a reaction rate of k-sub1CH3COCH2 plus HI as the rate determining step. An Arrhenius plot of the variation of k-sub 1 with temperature showed considerable scatter of the points, depending on the conditioning of the reaction vessel. After allowance for surface catalysis, the best line drawn by inspection yielded the Arrhenius equation, log(k-sub 1/reciprocal M sec) equals (11.2 plus or minus 0.8) minus (27.7 plus or minus 2.3)/theta where theta equals 2.203RT in kcal/mole. This activation energy yields an acetone C-H bond strength of 98 kcal/mole and enthalpy of the CH3COCH2 radical equal to minus 5.7 plus or minus 2.6 kcal/mole. As the acetone bond strength is the same as the primary C-H bond strength in isopropyl alcohol, there is no resonance stabilization of the acetonyl radical due to delocalization of the radical site. By contrast, the isoelectronic allyl resonance energy is 10 kcal/mole. Reasons for the difference are discussed in terms of the pi-bond energies of acetone and propene. (Author abstract modified)

8205

APTIC NUMBER 19010

Spall, B. C.
PHASE EQUILIBRIA IN THE SYSTEM SULPHUR DIOXIDE-WATER FROM 25-300 C. Can. J. Chem. Eng., vol. 41:79-83, April 1963. 13 refs.

The liquid-vapor phase relationships in the system sulfur dioxide-water were investigated by the dew and bubble point method. Measurements were made in the pressure range 4 to 250 atm and the

temperature range 25 to 350 C. At the higher temperatures and pressures, the mixture in the tube reacts to give sulfuric acid and sulfur, and the data in this region are inaccurate. Below the consolute temperature of 127.5 C, two liquid phases can be formed and the system becomes invariant when a vapor phase is also present. At higher temperatures, the phase diagrams are of simple shape; and above the critical point of sulfur dioxide, the liquid-vapor inhomogeneous regions become progressively smaller, eventually disappearing at the critical point of water. (Author abstract)

8206 APTIC NUMBER 19612

Stal'nakhova, I. P. and L. M. Sverdlov
EXPERIMENTAL AND THEORETICAL STUDY OF ABSOLUTE INTENSITIES OF INFRARED SPECTRA OF HYDROCARBONS IN THE GASEOUS PHASE. VIII. CALCULATION OF ELECTRO-OPTICAL PARAMETERS AND ABSOLUTE INTENSITIES OF INFRARED BANDS OF NORMAL PARAFFINS. (Eksperimental'noye i teoreticheskoye issledovaniye absolyutnykh intensivnostey infrakrasnykh spektrov uglevodorodov v gazovoy faze). Text in Russian. Opt. i Spektroskopiya, 24(3):393-398, 1968. 7 refs.

Experimental data on the absolute intensities of IR bands for propane, n-butane, n-pentane, and n-hexane are used to calculate a single system of electro-optical parameters characterizing the polar properties of C-H and C-C bonds. These parameters are used to calculate absolute intensities of the IR bands for these normal paraffins and both calculated and experimental values are tabulated for comparison.

8207 APTIC NUMBER 21931

Stedman, D. H. and D. W. Setser
CHEMICAL APPLICATIONS OF METASTABLE ARGON ATOMS. III. PRODUCTION OF KRYPTON AND XENON METASTABLE ATOMS. J. Chem. Phys., 52(8): 3957-3965, April 15, 1970. 40 refs.

An inexpensive experimental technique was developed for the production of argon, krypton, and xenon metastable atoms using a discharge-flow system. The reactions of these metastable atoms with nitrogen, carbon monoxide, and nitrous oxide were investigated in the pressure range 0.3-10 torr, and the emission spectra resulting from the reactions were identified. These spectra gave information about the collision event and also about some of the relaxation processes. Franck-Condon factors apparently do not control the molecular excitation processes in collisions of excited heavy atoms with light diatomic molecules. This discharge flow source of metastable atoms provides emission spectra of sufficient intensity from added CO and N2O for study of emission bands which currently are not well understood. Molecular emission from N2O has been observed, apparently for the first time. (Author abstract)

8208 APTIC NUMBER 19282

Stedman, D. H.
REACTIONS OF AR, KR, AND XE METASTABLES WITH SIMPLE NH-CONTAINING COMPOUNDS. J. Chem. Phys., 52(8):3966-3970, April 15, 1970. 26 refs.

The reactions of hydrozoic acid, ammonia, and cyanic acid with Ar, Kr, and Xe metastables were studied by the metastable atom technique for the determination of bond energies to NH-containing compounds. Spectroscopic observations of the resulting emission spectra showed that each metastable gave a very strong NH emission with considerable rotational excitation. The spectra were independent of the energy of the metastable and showed rotational excitation up to J equal to 35. The data obtained are consistent with the recent value of 91 kcal reciprocal mole reported for the heat of formation of the NH radical and also support a lower value for the NH separation than is currently accepted. Argon and xenon metastables were used in further work on the bond energies of CH-containing compounds. From the bond energies a heat of formation less than or approximately equal to 103 kcal reciprocal mole was obtained for the CN radical. The validity of spin conservation in metastable atom reactions and comparison of metastable impact excitation with vacuum ultraviolet photolysis are discussed.

8209 APTIC NUMBER 19018

Steinberg, Meyer and Russell M. Dietz
SR(90) OZONE GENERATOR FOR SUB-PPM CONCENTRATION RANGE. MODEL 1. INSTRUCTION MANUAL. Brookhaven National Lab., Upton, N. Y., Dept. of Applied Science, 27p., Nov. 1969.
CFSTI: BNL 14199

Operation, calibration, maintenance, and troubleshooting instructions are provided for a strontium(90) ozone generator designed to produce ozone in the concentration ranges 0.002-0.6 ppm by volume. These concentrations simulate normal atmospheric concentrations. The ozone is produced by radiolysis of O2 by beta radiation emitted by Sr(90). The generator requires no electric power. It has a long predictable life; the half-life of Sr(90) is 28 years. The inherent low concentrations eliminate dilution problems normally associated with electric discharge generators. The generator is rugged, portable, and has a simplicity not found in other generators. The user is cautioned to eliminate all water from the oxygen supply because of the catalytic action of the water vapor that results in the decomposition of the O3. Dryers recommended are a molecular sieve, an acetone-dry ice vapor trap, or both. Stainless steel is identified as the preferred material for both the vapor trap and any connections used. Cleaning and conditioning instructions are provided for connecting tubing. Preventive maintenance and troubleshooting instructions are included, the latter supplemented by a brief troubleshooting table.

8210 APTIC NUMBER 19164

Story, Paul R., W. Herbert Morrison, III, Thomas R. Hall, Jean-Claude Farine, and Clyde E. Bishop
PHOTOLYSIS OF OZONIDES. Tetrahedron Letters, no. 29:3291-3294, 1968. 10 refs.

Results from the photolysis of diisopropyl ozonide and cyclopentene ozonide are reported, to provide a means of removing from a molecule the elements of a double bond. After 150 minutes of irradiation with a 450 watt lamp, the first compound had lost 97% of its ozonide and yielded 14% isobutyraldehyde and 7% isobutyric acid when dissolved in pentane. Photolysis yielded 20% of a dimer and 50% methyl formate when the same compound was dissolved in methanol. The photolysis of the bicyclic cyclopentene ozonide in petane gave butyraldehyde, butyric acid, formic acid, cyclopropane, glutaric anhydride, carbon monoxide, and trace amounts of carbon dioxide and propane. The predominant photochemical process would seem to be a homolytic cleavage of the oxygen-oxygen bond, followed by a double beta-scission. Such a reaction might possibly be used to synthesize cyclopropanes, and perhaps even cyclobutanes by way of cyclohexene ozonide. 'Polymeric' ozonides give a higher yield of cyclopropane than monomeric ozonides.

8211 APTIC NUMBER 19163

Story, Paul R., Thomas K. Hall, W. Herbert Morrison, III, and J-C. Farine
THERMAL DECOMPOSITION OF OZONIDES. Tetrahedron Letters, no. 52:5397-5400, 1968. 13 refs.

A systematic study of diisopropyl ozonide and cyclopentene ozonide, with gpc monitoring of the decomposition and infrared and nmr spectroscopy of the products, was analyzed in comparison with previous photochemical studies of the same compounds. Decomposition of the first ozonide at 130 deg gives no carbon dioxide, only a trace of carbon monoxide, and 24% propane, together with a large amount of formic acid (22%). The propane would appear to be formed in some way other than by double beta-scission. Thermal decomposition of the second compound more nearly resembles that of photodecomposition, attributed to the absence of an intramolecular hydrogen abstraction process. Both the photochemical and thermal decomposition of an aliphatic ozonide begins with homolysis of the oxygen-oxygen bond, followed by a variety of reaction paths by which the di-alkoxy radical is transformed. Cyclopentene ozonide was found to be much more stable than the monocyclic ozonide.

8212 APTIC NUMBER 19102

Takagi, Sadayuki F., Gordon A. Wyne, Harunobu Kitamura, and Katsuhiro Ito
THE ROLES OF SODIUM AND POTASSIUM IONS IN THE GENERATION OF THE ELECTRO-OLFACTOGRAM. J. Gen. Physiol., 51(4):552-578, 1968. 65 refs.

The roles of sodium, potassium, chloride, calcium, barium, and other ions in the 'on' and 'off' types of electronegative mucosal potentials (EOG) were studied in order to clarify the ionic mechanisms underlying these potentials. The experimental material was olfactory epithelium excised from frogs, with menthone, amyl acetate, ethyl ether, and chloroform vapors as stimulants, and normal Ringer's solution of varying compositions as the test environment. Olfactory mucosal potentials were recorded with a pair of nonpolarizable electrodes. Detailed results for replacements and changes of Na(I) and K(I) in the Ringer solutions are given which demonstrate the essential role of these ions in negative EOG's. Thus, the EOG decreased in amplitude and in some cases nearly or completely disappeared when Na(I) in the solution was replaced by sucrose, Li(I), choline (I), tetraethylammonium (I), or hydrazine. In the K(I)-free solution, the negative EOG's first increased and then decreased in amplitude. It was also concluded that Ba(II) interferes only with Cl(-) influx, and that the negative EOG's are elicited by an increase in permeability of the olfactory receptive membrane to Na(I) and K(I) but not to Cl(-). From the ionic mechanism it is inferred that the negative EOG's are in most cases composites of generator and positive potentials. The ionic basis of these potentials was compared with that of other receptor potentials and a similarity of the negative EOG's with the end plate potential is suggested.

8213 APTIC NUMBER 19573

Taylor, W. F. and P. E. Blacet
PHOTOCHEMICAL OXIDATION OF BIACETYL BY MOLECULAR OXYGEN. Ind. Eng. Chem., 48(9):1505-1508, Sept. 1956. 15 refs.

The action of acetyl or methyl radicals when they are photochemically produced from biacetyl in the presence of molecular oxygen was studied. An experimental method to photooxidize biacetyl is described. Reaction products included carbon monoxide, carbon dioxide, formaldehyde, and water. Other products present in lesser quantities were methanol and acetic acid. Three series of experiments to determine quantum yields are described. A progression of 16 reaction steps to account for the various reaction products are postulated and discussed.

8214 APTIC NUMBER -----

Tereshchenko, L. Ya., V. P. Panov, and M. E. Pozin
EQUILIBRIUM BETWEEN NITROGEN OXIDES AND NITRIC ACID SOLUTIONS. J. Appl. Chem. USSR (English Translation from Russian of: Zh. Prikl. Khim.), 41(3):474-477, March 1968. 11 refs.

Data on equilibrium between nitrose gases and nitric acid solutions are very important for determining the rational conditions of conversion of nitrogen oxides. Equilibrium between nitrogen oxides and nitric acid solutions was studied over a wide range of partial pressures of nitrogen oxides and degrees of oxidation of the oxides, nitric acid concentrations, and temperatures; up to approximately 60% nitric acid concentration, the dependence of log K on the concentration is linear at the temperatures studied. Empirical equations are given for determination of log K and the logarithm of the overall equilibrium constant over a wide range of conditions. (Author conclusions modified)

8215 APTIC NUMBER 19022

Thelen, J., W. Tronnsdorff, and H. Wiegand
EXPERIMENTS ON THE PRODUCTION OF LIQUID DROPLETS OF UNIFORM SIZE. (Experimente zur Erzeugung von Fluessigkeitstropfen gleicher Groesse) Deutsche Versuchsanstalt fuer Luft-und Raumfahrt E. V., Stuttgart (West Germany), Rept. 67-91, 1967. 20 refs. Translated from German by Barbara Dickinson, Royal Aircraft Establishment, Farnborough (England), 47p., Sept. 1969.
CFSTI: N70-20232

Experiments to produce uniform-sized droplets by the action of sound or ultrasound on liquid jets are described. The liquid was injected into stationary air at atmospheric pressure or in a low-pressure chamber. Water, diesel oil, and glycerine were injected through nozzle tips with diameters of 0.1-0.35 mm. The discharge velocity was varied between 4 and 50 m/sec. The temperature of the liquid used in the experiment was approximately 20 C except in the case of the experiment with glycerine when the liquid was heated so that it left the jet at a temperature of approximately 35 C. The drop formation was initiated by interference frequencies of 5-40 kHz. The perturbation was superimposed on the liquid jet by means of an ultrasonic vibrator. The experiments showed that it is possible to produce regular series of droplets of equal size with diameters of 200-600 micron and with the distance between centers of drops equal to 2-4 times the drop diameter, from liquid jets in air at atmospheric pressure. The series of drops produced from water, diesel oil, and glycerine were characterized by good stability and uniformity. The results obtained were in good agreement with theoretical predictions and with the results of other experimental work.

8216 APTIC NUMBER 21742

Thomas, David G.
TRANSPORT CHARACTERISTICS OF SUSPENSIONS: PART IX. REPRESENTATION OF PERIODIC PHENOMENA ON A FLOW REGIME DIAGRAM FOR DILUTE SUSPENSION TRANSPORT. Am. Inst. Chem. Engrs. J., 10(3):303-308, May 1964. 40 refs.

Four different flow regimes may be identified during transport of dilute suspensions of solid particles through horizontal pipes by liquids in turbulent flow as the velocity is varied. The regimes may be characterized by the distribution of solids in the channel. In two of the regimes, the bulk of the material is immediately adjacent to the bottom of the channel and is clumped up either into transverse waves (dunes or islands) with a reproducible periodicity or into longitudinal waves (long stria). The definition of the other two regimes is somewhat more arbitrary but may qualitatively be described as heterogeneous or homogeneous flow. Extensive studies of the conditions under which transverse and longitudinal waves occurred, when combined with results of previous studies, showed that all four of these flow regimes may be conveniently represented on a single diagram in which the terminal-settling velocity divided by the friction velocity and the Reynolds number on particle diameter and friction velocity are the coordinates. Because the particle Reynolds number based on the terminal-settling velocity can be uniquely defined as an additional parameter on such a diagram, the particular flow behavior for any given combination of system and particle characteristics can be readily determined. (Author abstract)

8217 APTIC NUMBER 19001

Thomas, W. J.
THE ABSORPTION OF SULPHUR DIOXIDE IN WATER: PART I - THEORY. Trans. Inst. Chem. Engrs. (London), vol. 42:T3-T6, 1964. 13 refs. PART II. Ibid, vol. 42:T7-T12, 1964. 9 refs.

A theory is developed relating conditions at the gas/liquid interface to the transport of sulfur dioxide. The establishment of equilibrium at the interface is instantaneous, so that the reaction zone lies in the interface. Although the dissociation equilibrium down the concentration gradient is a complicated secondary process, consideration of the total concentration of all sulfur dioxide containing species allows the interfacial concentration to be defined in terms of total concentration. By use of a transport factor and the apparent equilibrium constant, methods are proposed for obtaining values of the individual film coefficients of mass transfer. Methods of determining the value of the transport factor are discussed. The theory is applied to two sets of experimental data. The experimental results and calculations support the theory presented. (Author abstract modified)

8218 APTIC NUMBER 19097

Torrents, Luis Marquet
LIBYAN GAS FOR BARCELONA. (Le gaz de Libye a Barcelone). Text in French. Revue Generale du Gaz, 88(5/6):75-77, May-June, 1966.

Plans are discussed for transporting natural gas from wells in Libya to Barcelona, Spain. At Marsa el Brega the gas will be liquefied and loaded onto specially equipped barges, which then will cross the Mediterranean to Barcelona where a special dock will be used for unloading into large storage tanks, each with a capacity of 40,000 cubic meters. The capacity of the barges will be 40,000 cubic meters, and they can be unloaded in 10 hours. Liquid gas will be separated into heavy and light components, the mixture used for fuel being reconstituted so as to be interchangeable with fuel gas from other sources. A contract is under negotiation with Esso Standard for the annual delivery of about 13,5000 million M cal from gas sources owned by Catalana de Gas y Electricidad in Libya.

8219 APTIC NUMBER 21865

Tsuchimoto, Koji, Yasuhiro Oda, and Yoshiro Morita
RATE OF CARBON MONOXIDE CONVERTION ON COPPER-ZINC CATALYST. (Do-aen-kei shokubai o mochiita issanka-tanso tenka-hanno no hanno-sokudo-shiki). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 73(1):137-145, Jan. 1970. 6 refs.

The girdler G-66 B copper-zinc catalyst (0.1 to 0.3 gram) with alpha-alumina was utilized to convert carbon monoxide under normal pressure and a temperature of 155 to 230 C. The equipment for the chemical reaction has a plexi-glass tube 10 mm in internal diameter. The catalyst was activated prior to the

reaction by the use of CO + H2 gas for 1.5 hour under 250 C. The influence of gas (CO,H2O,CO2,H2) expansion was least when the temperature was below 200 C. The reaction velocity was calculated by an equation using a velocity constant, an adsorption equilibrium constant, a reaction equilibrium constant, the partial pressure of each gas. Carbon monoxide, CO2, H2, and H2O gases were competitively adsorbed at the same point on the surface of the catalyst.

8220 APTIC NUMBER 21822

Vickers, R. S. and C. S. Foote
SOME PRELIMINARY OBSERVATIONS ON THE PHOTOOXYGENATION OF PYRIMIDINES. Preprint, California Univ., Los Angeles, Dept. of Chemistry, 9p., 1970 (?). 18 refs.

The photooxygenation of pyrimidines, which takes place slowly at biological pH, proceeds rapidly at high pH. The anion of the pyrimidine seems necessary for reaction. An intermediate has been observed in the low temperature photooxygenation of uracil in liquid ammonia. Possible structures for this intermediate are discussed. (Author abstract)

8221 APTIC NUMBER 19583

Voigt, Daniel, Pierrette Dagnac, and Louis Fournes
ON SOME PROPERTIES OF SULFUR OXIDES. (Sur quelques proprietes des oxydes du soufre). Text in French. Ann. Genie Chim., 1967: 52-60. 31 refs.

As determined by a magnetooptical study of liquid sulfur trioxide, the rotation of sulfur trioxide increases with temperature. Assuming that the compound is essentially composed of monomeric and cyclic trimeric molecules, the proportions of these components can be estimated in products of different origins, at different temperatures, and in the presence or absence of stabilizers. Molecules of the type P2NSO3(P being C2H5, C3H7, C4H9) have an experimental magnetooptical rotation smaller by 173 micrograms than the calculated sum of the rotations of the component molecules. With regard to the molecules R2NCHO-SO3(P being Ch3, C2H5), the difference between the calculated and the measured rotation is 45 micrograms. Although the contribution of the bond so formed is still negative, it is not identical with the preceding one. Measurements carried out on powdered S2O3 show that a small paramagnetism is all the more important as the alteration of the sample is clearly visible. However, by preparing S2O3 inside a measuring tube to postpone alteration or performing measurements in clean solution, a clear diamagnetism was observed.

8222 APTIC NUMBER 19610

Voloshchuk, V. M. and I. M. Levin
ON THE CRITICS OF THE AEROSOL FLUID HYDRODYNAMICS. (K kritike gidrodinamiki aerozol'noy zhidkosti). Text in Russian. Fiz. Atm. i Okeana (Moscow), 4(7):734-745, 1968. 19 refs.

The possibility of intersecting aerosol particle trajectories is demonstrated using the equation of the velocity field of the medium as a function of aerosol particle velocity and Stokes number. Numerous examples are presented for the intersection of particle trajectories in the forward, lateral, and bottom flow segments. A brief analysis is made of certain fundamental results derived from an aerosol fluid model. Results presented are purely heuristic in nature, but have practical implications.

8223 APTIC NUMBER 21738

Vonela, Richard A. and Kenneth T. Whitby
THE CHARGING AND MOBILITY OF CHAIN AGGREGATE SMOKE PARTICLES. J. Colloid Interface Sci., vol. 25:568-576, 1967. 15 refs.

The fluid drag force and unipolar diffusion charge on chain aggregate smoke particles produced by an exploding wire and from a hydrocarbon flame were studied with a system consisting of an electrical particle counter and classifier and a condensation nuclei counter. From measurements of particle electric mobility, electric charge, and numbers of primary particles per aggregate, the fluid drag as a function of equivalent spherical diameter was measured and compared with three different theories. For aggregates consisting of from 10 to 300 primary particles having a mass mean diameter on the order of 0.05 micron, the fluid drag was nearly the same as that of a sphere having a volume equivalent to that of the aggregate. The diffusion charge was about 70% higher than that of the equivalent sphere. The theory and data suggest that the relative independence of fluid drag and shape for this size aggregate is due to the opposite effects of increased surface area and gaseous slip. (Author abstract)

8224 APTIC NUMBER 21915

Wajsfelner, M., G. Madelaine, J. Delhaye, J. Bricard, and B. Liu
INFLUENCE OF LIQUID CONDUCTIVITY ON LATEX AEROSOL CHARGE. Aerosol Sci., 1(1):3-7, 1970. 10 refs.

The electric charge on polystyrene latex aerosols produced by the atomization-drying process was measured as a function of the electrolytic conductivity of the liquid suspension. The conductivity was varied by the addition of hydrochloric acid or sodium hydroxide to the liquid suspension. The resulting charge on the latex aerosol decreased with increasing conductivity of the liquid suspension, contrary to the prediction of Smoluchowski's equation. The discrepancy was attributed to the effect of electrical conduction and charge neutralization during the atomization process. (Author abstract modified)

8225 APTIC NUMBER 21970

Wang, J. C. and D. M. Himmelblau
A KINETIC STUDY OF SULFUR DIOXIDE IN AQUEOUS SOLUTION WITH RADIOACTIVE TRACERS. Am. Inst. Chem. Engrs. J., 10(4):574-580, July 1964. 29 refs.

A kinetic study of the homogeneous reactions in the sulfur dioxide-sodium bisulfite-water system with a radioactive tracer technique is described. By operating this system at chemical equilibrium but at isotopic disequilibrium, the influence of the diffusion of the SO2 into and out of the aqueous solution could be divorced from the kinetic effects of the chemical reaction. The rate of reaction of this system could be followed by analyzing the radioactive sulfur-35 in the form of gaseous SO2, with the Bernstein-Ballentine technique. Data were collected at temperatures of 0 deg to 20 deg C and at pH ranges from 1.25 to 4.3. Analysis and correlation of the experimental data by different kinetic models demonstrated that the classical reaction SO2 plus water yielding hydrogen (+) and sulfurous radical (-) represented the experimental data best from a microscopic viewpoint. Because of the low pH conditions employed, it was not possible to obtain rate data for the reaction SO2 plus hydroxide(-) yielding the sulfurous radical. Forward and reverse rate constants are reported for the first time for this system. (Author abstract)

8226 APTIC NUMBER 19081

Weinstein, M. and A. Broido
PYROLYSIS-CRYSTALLINITY RELATIONSHIPS IN CELLULOSE. Combust. Sci. Technol., vol. 1:287-292, 1970. 19 refs.

During pyrolysis of pure cellulose, the Crystallinity Index (CrI) remained fairly constant over more than 50% weight loss before dropping rapidly as the X-ray pattern deteriorated. With samples first treated with trace quantities of inorganic salts, heating first increased the CrI; the results imply a preferentially catalyzed decomposition of the amorphous regions. Swelling cellulose in liquid ammonia eliminated the crystalline diffraction pattern, but heating restored a considerable degree of order. The initial weight loss rate in the swelled material was considerably accelerated and the ultimate char residue reduced. The results support the suggestion that inter-ring cross-linking leading to enhanced char formation will occur preferentially in the ordered rather than the disordered regions of natural cellulose. (Author abstract)

8227 APTIC NUMBER 21909

Whitaker, Stephen and R. L. Pigford
RESPONSE OF A GAS-LIQUID INTERFACE TO CONCENTRATION PULSES. Am. Inst. Chem. Engrs. J., 12(6):741-746, July 1966. 20 refs. (Presented at the American Institute of Chemical Engineers Mexico City Meeting.)

Frequency response techniques have been applied to the study of the absorption of sulfur dioxide in water contaminated with surface-active material. The response of a 0.0004 in. thick liquid film to a sinusoidally varying SO2 pressure was determined for frequencies ranging from 1 to 10 cycles/second. The total quantity of SO2 dissolved was observed continuously by measuring the amount of light absorbed by the film, which contained a colored hydrogen ion indicator, cresol red. The experimental data indicate the presence of a surface phase of absorbed material through which SO2 molecules had to pass as they were transferred between gas and liquid. In addition to creating a resistance to the passage of the solute molecules, the surface phase apparently was capable of storing the molecules temporarily. (Author abstract)

8228 APTIC NUMBER 19943

Wiley, Richard M., Henning F. Proelss, and Raymond Chang
EPR STUDY OF THE KINETICS OF THE FORMATION OF RADICALS FROM DIBENZOYL PEROXIDE ON POROUS GLASS. J. Macromol. Sci. Part A, 4(1):187-202, Jan. 1970. 18 refs.

A study was undertaken to determine whether or not it is possible to evaluate the kinetics of formation of short-lived radical intermediates during thermal decomposition reactions by stabilizing the radicals on porous glass and following the intensity of the EPR signals obtained. Conditions were defined under which the radical signal derived from dibenzoyl peroxide could be followed over a temperature range suitable for kinetic studies. The kinetics of formation of radicals from dibenzoyl peroxide supported on porous glass were determined using EPR techniques over a temperature range of 25-100 C. Values of the activation energy of 18.5 and 25 kcal/mole were observed for two differently prepared porous glass support materials. The ference between these values and the thermal (solution) values of 29-31 kcal/mole may be related to surface adsorption energy, an induced decomposition reaction, a surface catalytic effect, or some combination of these.

8229 APTIC NUMBER 21900

Wong, Edgar L. and Frank E. Belles
ACTIVATION ENERGIES FOR REACTIONS OF HYDROXYL RADICALS WITH HYDROGEN AND CARBON MONOXIDE. National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TN D-5707, 17p. March 1970. 15 refs.

Rate constants for the reaction H2 plus OH yields H20 plus H were measured at temperatures of 304, 403, and 503 K using a mass-spectrometric stirred-reactor technique. The room-temperature result was close to other values in the literature but the activation energy, measured directly for the first time, was 4.2 plus or minus 0.3 kilocalories per mole (17.6 plus or minus 1.3 kJ/mole), which was less than the Leeds group's estimate of 5.15 plus or minus 0.15 kilocalories per mole (21.56 plus or minus 0.63 kJ/mole) that was based on indirect evidence. Re-analysis of previous CO plus OH yields CO2 plus H data by using either the newly determined activation energy or the previous energy of 5.2 kilocalories per mole (21.8 kJ/mole) brought the two sets of CO plus OH rate constants into essentially perfect agreement and established the activation energy of this reaction as 1.12 kilocalories per mole (4.69 kJ/mole). The discrepancy in the previous high-temperature CO plus OH yields CO2 plus H data was due to the fact that the previous equation that was used to calculate the rate constant was inadequate. (Author summary modified)

8230 APTIC NUMBER 19914

Wood, Bernard J., Wohoru Endow, and Henry Wise
COMPETITIVE SORPTION KINETICS OF OXYGEN AND CARBON MONOXIDE ON PLATINUM. J. Catalysis, 18(1):70-76, 1970. 14 refs.

The sorption of oxygen on a polycrystalline platinum ribbon is studied with the aid of a quadrupole mass analyzer in an ultrahigh vacuum system. An evaluation of the reaction coefficint and the total mass of oxygen sorbed indicates that oxygen competes with carbon monoxide, present as a background contaminant, for the sorption sites on the flash-cleaned platinum surface. Subsequent desorption of oxygen is not observed when the platinum is flash heated to temperatures up to 1100 K; carbon monoxide and carbon dioxide are predominant species leaving the platinum surface. The relative amount of each component depends on the length of exposure of the flash-cleaned platinum ribbon to the background gas and to oxygen. A high reaction coefficient is suggested of oxygen on a clean platinum surface at room temperature. (Author abstract modified)

8231 APTIC NUMBER 21769

Yoshida, Katsumi, Hidehiko Oshima, Hiroshi Sasaki, and Yoshikazu Takatsuka
ON THE ANTI-CANCER ACTION OF SOME DERIVATIVES OF O-METHYL-P-HYDROXY-AZO-BENZENE. Mie Med. J., 9(1):31-34, 1959. 3 refs.

The anti-cancer action of eight derivatives of o-methyl, p-hydroxyazobenzene was studied for comparison to the effects of 3-nitro, 4-rhodano, 2'-methyl, 4'-hydroxyazobenzene (No. 9). Mice with ascites cancer were injected with the compounds, and at intervals of two, four, and 24 hrs. after injection, microscopic examination was made of the percentage of each cell division phase to total tumor cells. The compound 3-nitro, 2'-methyl, 4'-hydroxyazobenzene was found to have an inhibitory action similar to No. 9, and an effective anti-cancer agent may be discovered within the azoderivatives. Anthranilic acid and 5-hydroxy-anthranilic acid, the normal intermediate of tryptophan metabolism, produce the characteristic cytolysis to Erlich's tumor cells. (Author conclusions modified)

8232 APTIC NUMBER 19451

Zubkov, A. V., A. T. Koritskii, and Ya. S. Lebedev
FORMATION OF RADICAL PAIRS IN THE RADIOLYSIS AND PHOTOLYSIS OF ORGANIC PEROXIDES. Dokl. Phys. Chem. Sect. (English translation from Russian of: Doklady Akad. Nauk SSSR), 180(4-6):437-440, June 1968. 13 refs.

ERP signals obtained during ultra-violet and beta-irradiation of a series of organic peroxides and hydroperoxides were analyzed to identify and establish the existence of radical pairs in the solid phase. Photolysis of the substances was conducted at 77 K using a DRSh-250 lamp directly in the resonator of an ESR spectrometer. Radiolysis was carried out on a fast electron accelerator, also at 77 K. The ESR spectra were recorded at 77 K and higher. In the photodecomposition of organic peroxides in the solid phase, actually unstable pairs of radicals are formed. Radical pairs can be formed in the beta radiolysis of organic substances. The structure of the pair formed in diphenylethane hydroperoxide was in good agreement with the concept of paired formation of radicals with elimination of water in substances with strong hydrogen bonds.

8233 APTIC NUMBER 19270

Abegg, Jean-Louis, Henri de Beaulieu, Giuliana Ghilardi, and Gregoire Kalopissis
PROCEDURE FOR INCREASING THE FIRMNESS AND RESILIENCE OF DEPLETED HAIR. (Procede pour accroitre la solidite et l'elasticite de cheveux affaiblis). Text in French. (L'Oreal, Paris (France)) Swiss Pat. 474,567. 4p., Nov. 14, 1969. (Appl. April 19, 1967, 8 claims).

Human hair depleted by atmospheric agents, elements from the soil, sea water, dyeing, or permanents can be rendered nearly as firm and resilient as healthy hair by treatment with a family of organic nitrogen compounds which includes monomethyloldicyanodiamide and methoxymethyldicyanodiamide. The first of these has the advantage of being highly and readily soluble in water.

8234 APTIC NUMBER 20820

COMMUNITY AIR QUALITY GUIDES: SULFUR COMPOUNDS. Am. Ind. Hyg. Assoc. J., 31(2):253-260, March-April 1970. 26 refs.

The major sulfur compounds detected in the atmosphere are sulfur dioxide, sulfur trioxide, sulfuric acid, sulfates, and hydrogen sulfide. The chief effects of SO2 are eye and respiratory tract irritation, and increased pulmonary resistance. At concentrations of 87 mg/cu m for 2.75 hours, SO3 proved fatal to guinea pigs. Hydrogen sulfide is a respiratory and eye irritant at low concentrations, and at high concentrations can cause respiratory paralysis. It is believed that sulfur compounds produce a more severe effect when they are adsorbed on a particle small enough to penetrate the lung. Sulfur oxides and hydrogen sulfide can also damage vegetation. Materials such as metals, paper, leather, textiles, paint, and ceramics are also damaged by sulfur compounds. It is suggested that the sulfur oxide concentration in the air kept as low as possible to prevent damage to vegetation, deterioration of materials, and to avoid the presumed adverse health effects. Methods for sampling sulfur compounds and their physical and chemical properties are also included.

8235 APTIC NUMBER 11630

Antal, Andrei, Jeanette Timacu, Elena Muncaci, Ecaterina Ardevan, Ala Ionescu, and Lia Sandulache
VARIATIONS OF THE ORGANISM REACTIVITY AND THE STATE OF HEALTH OF CHILDREN IN REGARD TO TOWN AIR POLLUTION. (Les variations de la reactivite de l'organisme et de l'etat de sante des enfants en rapport avec la pollution de l'air communal). Atmos. Environ., 2(4):382-392, 1968. 33 refs. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 20p.

Organism reaction and state of health of the child population in a metallurgical center where atmospheric lead concentrations exceeded prevailing sanitary standards was studied in various investigations (clinical, somatometric, capillaroscopic, nerve reactivity, adaption disturbance, psychometric, etc.) In a parallel manner, children in a control city where the air was relatively pure were examined. The observations were made on varying numbers of children, according to the kind and character of the tests. Antropometric tests were applied to 2310 children, dynamometric to 1702, capillaroscopic to 1658, and tests of neuropsychic activity to 258-948 children. The data obtained indicate a decreased resistance of the respiratory apparatus to pathogenic agents on the part of the children in the polluted city. In particular, upper respiratory tract infections, pneumonia and bronchopneumonia, anemia, anitaminosis, rachitis, disorders of the digestive tract, and dental decay were more frequent by 9 to 31%. In addition, the children exhibited poorer psychical and physical development, more frequent adjustment problems, reduced scholastic performance, and greater frequency of aberrant capillaries. The degree of air pollution reaction differences was found to be related not on the extent of pollution, but also to the degree of development, sex, age, biological condition of the subjects, and duration of exposure. Sensitivity was greater in girls and preschool children, and proportional to the length of exposure to pollutants.

8236 APTIC NUMBER 20812

Ayres, Stephen M. and Stanley Giannelli Jr.
PHYSIOLOGIC ASPECTS OF AIRWAY OBSTRUCTIVE DISEASE. Advan. Cardiopulmonary Diseases, vol. 4:249-270, 1969. 10 refs.

Physiologic studies suggest that a more realistic classification of chronic obstructive pulmonary disease (asthma, bronchitis, emphysema) must be based on the readily measured criteria of presence and reversibility of airway obstruction and on the degree of hyperinflation. The Hagen-Poiseville equation enables the direct calculation of either expiratory or inspiratory resistance provided both flow rate and driving pressure are known. Flow rate is easily measured by a wire mesh pneumotachygraph, and mouth pressure by a conventional strain guage manometer. Intrathoracic, or pleural, pressure is measured by a catheter positioned in the thoracic esophagus. Conductance-volume ratio is useful for assessing airway obstruction in the presence of varying lung volumes. Because of the close relationship between expired volume and flow rate, a graph of expired flow and lung volume (a flow-volume curve) provides a valuable technique for evaluating the behavior of expiratory flow rate with decreasing lung volume. The location of the points at which pleural pressure equals airway pressure appears to determine the configuration of the flow-volume curve. Distortion of the flow-volume curve in obstructive disease may well be accounted for by the difference between rate of change of actual thoracic gas volume and apparent thoracic volume as measured by the spirogram. More important than absolute differences between asthma and emphysema is the response of the flow-volume curve to a nebulized bronchodilator: flow rates markedly increase following a bronchodilator, and the shape of the flow-volume curve approaches normal with asthma. Certain patients with severe chronic bronchitis may become normal following abstinence from smoking or freedom from air pollutants, and should properly be diagnosed as examples of 'pollutant bronchitis.' Airway resistance is elevated during inspiration but markedly increases during expiration, explaining the striking decreases

in expiratory flow shown in the flow-volume curves of emphysema.

8237 APTIC NUMBER 19025

Balbo, M., V. Marucci, and G. Umani Ronchi
CARBOXYHEMOGLOBIN BLOOD VALUES UNDER VARIED INDIVIDUAL AND ENVIRONMENTAL CONDITIONS; PRELIMINARY STUDIES. (Les valeurs de l'oxycarbonemie en differentes conditions individuelles et de milieu; recherches preliminaires). Text in French. Acta Med. Leg. Soc. (Liege), vol. 19:187-189, April-June 1966.

A group of 148 subjects occupationally exposed over long periods to the toxic action of carbon monoxide were compared with 251 unexposed subjects. Carboxyhemoglobin was determined by spectrophotometry. All subjects were males, and were divided into 9 groups, according to their occupational exposure, smoking habits, and the presence of chronic bronchitis and pulmonary emphysema. Healthy nonsmoking subjects not occupationally exposed to CO had an average COHb rate of 1.9%. Nonexposed smokers had a slightly higher rate, which increased considerably for those who smoked more than 20 cigarettes per day. Both smokers and nonsmokers with respiratory illnesses showed notably higher values, the highest values occurring among smokers. Both smokers and nonsmokers who were occupationally exposed showed higher values, with even higher values for the smokers than nonsmokers. Exposed individuals, both smokers and nonsmokers, with respiratory illnesses did not have substantially different values from those of their healthy counterparts. No correlation was found between COHb and the number of years of exposure. In some cases, exposed subjects gave a zero reading for COHb, while some individuals who were unexposed, did not smoke, and had no respiratory illnesses showed rather high values, so that the blood level of carboxyhemoglobin cannot be regarded as an infallible test for these conditions.

8238 APTIC NUMBER 19049

Barrett, Gerald V. and Richard H. Franke
SOCIAL, ECONOMIC, AND MEDICAL EXPLANATIONS OF 'PSYCHOGENIC' DEATH RATE DIFFERENCES: A CROSS-NATIONAL SURVEY. Rochester Univ., N. Y., Management Research Center, ONR Contract N00014-67-A-0398-0002, NR 171-029, TR-32, 27p., Sept. 1969. 31 refs.
CFSTI, DDC: AD 7 00286

Social, economic, and medical variables correlated with 'psychogenic' death rates across 30 countries. Status integrations correlated positively with homicide, and negatively with suicide and ulcer deaths. Cadmium in the environment may lead to hypertension. Figures for commercial zinc were used, since cadmium is associated with zinc in air, water, and food. Zinc consumption per capita in 14 countries was correlated with hypertension death rates. Concurrent and lagged correlations of 1950 and 1965 zinc consumption with hypertension deaths were from 0.30 to 0.67, with three out of four correlations significant. Low life expectancy, wealth, economic growth, and wine consumption correlated with deaths from homicide, suicide, ulcers, and cirrhosis, respectively.

8239 APTIC NUMBER 21830

Beard, Rodney R. and Netta Grandstaff
CO EXPOSURE AND CEREBRAL FUNCTION. Preprint, New York Academy of Sciences, New York, 18p., 1970. 30 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

There is no consistent pattern of permanent damage following recovery from a coma caused by carbon monoxide asphyxiation. Affected persons show symptoms not clearly correlated with the degree of exposure. Development of sensitive, reliable tests for effects of small doses of toxic agents upon human performance is necessary. Experiments attempting to correlate CO exposure with timing behavior, visual performance, and auditory threshold are discussed. The obvious effect of CO in man is the binding of hemoglobin, thus diminishing the oxygen-carrying capacity of the blood. It appears that a small carboxyhemoglobin (COHb) concentration can cause a significant reduction of the oxygen supply to a tissue with high oxygen demand, such as the brain. The relationship of COHb to other physiological traits are discussed. Testing situations are evaluated to determine critical characteristics.

8240 APTIC NUMBER 21671

Becklake, Margaret R., H. I. Goldman, A. Rae Bosman, and C. C. Freed
THE LONG-TERM EFFECTS OF EXPOSURE TO NITROUS FUMES. Am. Rev. Tuberc. Pulmonary Diseases, vol. 76:398-409, 1957. 27 refs.

Seven patients who had recovered from an episode of acute pulmonary edema after an exposure to nitrous fumes were studied for periods of up to 64 months after the accident. There was good agreement between subjective complaints and demonstrable disturbances of physiologic tests. Reduction in maximal breathing capacity and increase in respiratory resistance were the usual physiologic disturbances. Two patients showed an increase in the absolute value of residual volume and an increase in its percentage value of total lung capacity. Such changes are usually associated with emphysema or bronchospasm. However, these conditions were not thought to be present in these cases. It is suggested that the patients had some degree of bronchial and bronchiolar narrowing due to the healing by fibrosis of various degrees of bronchiolitis obliterans following the exposure to nitrous fumes. (Author summary modified)

8241 APTIC NUMBER 21711

Buckley, Ramon D. and Oscar J. Balchum
OXYGEN CONSUMPTION OF GUINEA PIG LUNG TISSUE FOLLOWING ACUTE AND CHRONIC EXPOSURES TO NITROGEN DIOXIDE. Preprint, California State Dept. of Public Health, Berkeley, 15p., 1964. 9 refs. (Presented at the Air Pollution Medical Research Conference, 7th,

Los Angeles, Calif., Feb. 10-11, 1964.)

Exposure of guinea pigs to nitrogen dioxide concentrations of 5 ppm and above have been shown to result in histological changes in the lung tissues and the development of serum antibodies against the normal lung proteins. These findings suggest that NO2 may have widespread effects on animal tissues. To assess the effect of NO2 on cellular respiration values (QO2), lactic acid dehydrogenase (LDH), and aldolase levels were determined from lung, liver, kidney, and spleen homogenates obtained from animals after acute and chronic exposures. Widespread effects were observed in the QO2, LDH, and aldolase activity. Oxygen consumption of lung tissue was altered little by either acute or chronic exposures. Exposed liver homogenate increased over control values in acute exposures. Spleen and kidney homogenates increased in oxygen consumption with both exposures. The oxygen consumption data indicate that the enzyme systems of the tissue homogenates studied respond differently to NO2. The aldolase and LDH activities are increased by both exposure regimens. The increase appears to be a response of each organ to the NO2 independent of the concentration or time of exposure. The relative change in activity varies widely in different organs. This indicates that tissues may respond to NO2 through a different mechanism, or that the effects of NO2 may not be the same for all tissues.

8242 APTIC NUMBER 19360

Buechley, Robert William
LUNG CANCER EPIDEMIOLOGY IN THE ROCKY MOUNTAIN STATES, 1953-1962. California Univ., Berkeley, Thesis (Ph.D.), 1965, 207p. 120 refs.

Some hypotheses of the etiology of lung cancer were assessed by using them to elucidate the lung cancer rates of populations in the Rocky Mountain area in a specific time period. Two conventional hypotheses, the 'cigarette hypothesis' and the 'urban hypothesis', were compared to the proposed hypothesis that 'Arsenic bearing particles, dust, gas, or droplets are strongly carcinogenic; when inhaled, they cause lung cancer.' The analysis was initiated by evidence that miners and other workers exposed to arsenic had an inordinately high incidence of lung cancer. The analysis showed a strong relationship between a high proportion of workers in mining occupations in a county and high lung cancer in that county. Although strong, this relationship is far from perfect. The facts disprove all hypotheses stating any one element to be necessary. But a strong effect, involving some common characteristic of the mining counties, is clearly established. Other effects, urban-rural, level of development, and smoking, each of a strength about one-fifth that of the mining effect, were discerned. No one or combination of these effects could replace the mining effect in predicting high lung cancer in mining counties. A strong migration effect, from declining mining areas to growing neighboring areas, can be hypothesized. It offers excellent possibility of further documentation and elucidation of the miner effect. Work histories and residence histories of decedents might clarify possible exposures.

8243 APTIC NUMBER 21670

Carson, Theophilus R., Edward J. Donati, and Leo Feinsilver
RESPONSES OF ANIMALS INHALING THE DECOMPOSITION PRODUCTS OF SIX LUBRICATING OILS. Army Chemical Research and Development Labs., Edgewood Arsenal, Md., Toxicology Division, Proj. 4C61-14-002, TR-CRDLR 3039, 20p., Feb. 1961. 11 refs.

The responses of rats and dogs inhaling the decomposition products of six lubricating oils were studied. The oils tested were: WF-134, an ester of fluoroalcohol and camphoric acid; WF-179, an adepate di-ester and an unidentified complex ester; WF-160, a penta-erythritol ester; WF-180, a mixture of di-2-ethylhexyl sebacate and di-2-ethylhexyl adipate; WF-182, an alkyl ester of sebacic acid with additives; and WF-183, a di-2-ethylhexyl sebacate with additives. The animals were exposed to aerosols of the oils unheated or pyrolyzed at temperatures from 400 F to 1560 F. Neither the unheated oils or those heated from 400 F to 700 F caused deaths, produced more than a few toxic signs, or produced more than moderate pathologic changes. All oils were toxic when pyrolyzed at 1020 F and 1560 F. The toxic signs and pathologic changes showed that the pyrolysis products were eye and lung irritants. The lowest temperature at which death occurred was 1020 F for all oils but WF-180, which caused death only at 1560 F. Based on mortalities, it is concluded that the order of decreasing toxicity is WF-183, WF-179, WF-160, WF-182, WF-134, and WF-180. (Author abstract modified)

8244 APTIC NUMBER 21996

Clutton-Brock, John
TWO CASES OF POISIONING BY CONTAMINATION OF NITROUS OXIDE WITH HIGHER OXIDES OF NITROGEN DURING ANAESTHESIA. Brit. J. Anaesthesia, vol. 39:388-392, 1967.

Contamination of nitrous oxide with higher oxides of nitrogen occurred in two women during anesthesia. Cyanosis was observed and signs of respiratory distress ensued. One patient died and postmortem examination showed that her lungs were extremely edematous and very solid. There was also a bilateral pneumothorax which almost certainly was due to the unavailing attempts to keep her lungs ventilated. Methaemoglobin was present in the arterial blood.

8245 APTIC NUMBER 19126

Coffin, David L.
STUDY OF THE MECHANISMS OF ALTERATION OF SUSCEPTIBILITY TO INFECTION CONFERRED BY OXIDANT AIR POLLUTANTS. Preprint, 9p., 1969. 11 refs. (Presented at the Conference on Inhalation Carcinogenesis, Gatlinburg, Tenn., Oct. 9, 1969.)

Ozone, nitrogen dioxide, and artificial auto smog reduce the ability of animals to cope with aerosols of pathogenic bacteria. A model system employing ozone and streptococcus C in mice was explored to delineate the mechanism involved. Ozone elicits a slowing of the bacterial clearance rate from the lung. This appears to be the result of a longer maintenance viability, a shortening of the lag phase, and an acceleration of growth of the

introduced organisms. Invasion of the blood, which began two days after exposure, occurred more rapidly in ozone treated animals. This invasion appeared to be positively related to mortality in both exposure and control groups. The earlier death in the ozone exposed mice appeared consistent with the more rapid bacterial growth in the lung and earlier invasion of the blood associated with the ozone treatment. Experiments performed in rabbits were monitored by the pulmonary lavage method. Exposure to ozone elicited an influx of polymorphonuclear leukocytes which persisted for more than 24 hours after exposure. A reduction in the number of pulmonary macrophages also occurred. There was a significant reduction in the ability of these cells to phagocytize the bacteria previously introduced. These findings indicate that exposure to ozone intensifies the invasion of the lung and blood stream in the mouse streptococcus model. (Author abstract modified)

8246 APTIC NUMBER 19160

Conradi, Carmen R., Yusuf Kapanci, Ewald R. Weibel, and Roger L. Sopher
ELECTRON MICROSCOPIC AND MORPHOMETRIC STUDY OF MONKEY AND DOG LUNGS EXPOSED TO BERYLLIUM-CONTAINING DUST. (FINAL REPORT). Bern Univ. (Switzerland), Contract F61(052)-68-C-0030, Proj. 6302, Task 630206, AMRL-TR-69-45, 17p., Aug. 1969. 20 refs.
CFSTI, DDC: AD 695486

The investigation of the lungs of monkeys and dogs exposed to a beryllium oxide-contaminated atmosphere is discussed. Lungs of both test groups, and those of controls, were prepared for electron microscopic and morphometric analysis two years after exposure. Histologic examination revealed no fibrotic changes of pulmonary parenchyma in the exposed animals. The structure of the lung tissue of exposed animals was identical to that of control animals. Neither the arithmetric or harmonic mean thickness of the air-blood-barrier was changed; it was impossible to demonstrate edematous or proliferative changes. It is concluded that beryllium oxide has not caused any pathological alterations in lung tissue after two years of exposure. (Author abstract modified)

8247 APTIC NUMBER 19073

Cowan, D. W. and H. J. Paulus
RELATIONSHIP OF AIR POLLUTION TO ALLERGIC DISEASES. (FINAL REPORT). Minnesota Univ., Minneapolis, Univ. Health Service and Minnesota Univ., Minneapolis, School of Public Health, PHS Grant AP 00090, 143p., Dec. 1969. 28 refs.

An asthma study involving students at the University of Minnesota was conducted through 8 academic years covering 1959-1967. Data was gathered on asthma incidence in a special student group by completion of asthma diaries and by information obtained on visits to the allergy clinic. All students in the study were given a set of skin tests including many involving grains and grain pollutants. Data on the physical and chemical characteristics of the atmosphere were obtained by means of a sampling network located on and near the University campus. Five of eight years of data were assembled, edited, and proceessed for statistical analysis by computer. A completely randomized block statistical analysis scheme was used. Environmental parameters were analyzed as treatment effects. Linear regression was performed for asthma on the vector components of wind direction. The strongest association with student asthma was observed for smoke spot readings. A strongly positive relationship, significant at the 0.1% level, was found for data from two specific stations. Student with a positive skin test to grain mill dust showed a significantly higher response to smoke spot than students with a negative skin test. A significant relationship was also found for sulfur dioxide concentration and student asthma. The association of wind direction with asthma showed that east and west winds tend to produce above average attack rates. All of the observations support the conclusion that both particulate and gaseous air pollutants induce asthma. There is no evidence that specifically indicates that grain mill pollution is a cause of asthma attacks among the student body. Weather parameters, with the exception of temperature and relative humidity, were only weakly associated with asthma attacks. A positive association with barometric pressure change and days with rainfall was determined, indicating the possibility of a physical induction of asthma. The strong inverse relationship with temperature may be due to either a physical induction of asthma by cold air or a correlation with sulfur dioxide. The positive relationship with temperature may be due to either a physical induction of asthma by cold air or a correlation with sulfur dioxide. The positive relationship of student asthma with humidity is most readily interpreted by its effect on airborne particles. In general, metecrological effects appear to be less important than air pollution. (Author summary modified)

8248 APTIC NUMBER 21907

Crocker, T. Timothy
AIR POLLUTANTS ON RESPIRATORY MUCOSA IN ORGAN CULTURE. California Univ., San Francisco, Medical Center, Grant AP 00608, 32p., Aug. 31, 1969. 16 refs.

A project to determine whether the contents of benzene extracts from air pollution filter collections were injurious to respiratory mucosa is described. An organ culture system was used to expose tracheobronchial structures from suckling hamsters, fetal dogs and monkeys, and adult human bronchial mucosa. Air pollution materials tested include the whole benzene-soluble extract, the basic, acidic, and neutral fractions, and 14 subfractions of the neutral fractions. In addition, four carcinogenic and eight noncarcinogenic polycyclic aromatic hydrocarbons were tested in parallel with the whole extract. Lesions of epithelium were produced in many of the test animals. The predominant response of human mucosa was toxic destruction of epithelium. The possiblity that Vitamin A can inhibit or reverse lesions produced by air pollutants in hamster tissue is under study. (Author summary modified)

8249 APTIC NUMBER 19558

Dalquen, P., A. F. Dabbert, and I. Hinz
ON THE EPIDEMIOLOGY OF THE PLEURAMESOTHELIOMA. PRELIMINARY

REPORT ON 119 CASES FROM THE HAMBURG AREA. Praxis Pneumol., 23(8):548-558, Aug. 1969. 17 refs. Translated from German. Belov and Associates, Denver, Colorado.

The epidemiology of 119 cases of pleuramesothelioma, a rare malignant tumor, was studied in Hamburg with its asbestos and wharf industry. An analysis of the case material revealed an increased incidence of pleural mesothelioma in Bergedorf, a district of Hamburg where an asbestos works was located. The role of occupational, residential, and domiciliary exposure to asbestos in the development of the tumor is discussed. The importance of obtaining detailed records is stressed, since asbestos exposure may occur in a great variety of occupations. The average interval between the first exposure and development of the tumor was 35.2 years. Exposure to asbestos was definitely established in 17 cases and was likely 34 cases, but in 64 cases evidence of exposure was lacking or tenuous. (Author abstract modified)

8250 APTIC NUMBER 21846

Dinman, Bertram D.
ELEVATIONS IN LEVELS OF RED CELL 2-3 DIPHOSPHOGLYCERATE IN RESPONSE TO CO EXPOSURE. Preprint, New York Academy of Sciences, New York, 7p., 1970. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

The erythrocyte has been known to contain 2,3 Diphosphoglycerate (DPG) in a free and hemoglobin bound form. Recently DPG was shown to markedly affect the carriage of oxygen by hemoglobin, particularly causing a shift of the oxyhemoglobin curve to the right. Control of this metabolite's production serves as a fine tuning mechanism of the red blood cell's intrinsic function. Feedback controls sense only the free DPG in the cell. With oxyhemoglobin normally saturated, fewer binding sites are available to DPG. This causes an excess of free DPG which depresses DPG synthesis in the erythrocyte. Another mechanism sensitive to hypoxia which enhances DPG synthesis is hypothesized. Since COHb has a low affinity for DPG, the presence of CO loading should suppress red cell DPG levels. However, if the COHb peak level remains below 20%, such hypoxic stress caused an increase in DPG. The data also suggest that higher levels of COHb will diminish DPG synthesis to over-ride the antagonistic affect of hypoxia upon this metabolite. (Author abstract modified)

8251 APTIC NUMBER 19148

Feldstein, Milton
TOXICITY OF AIR POLLUTANTS. Bay Area Air Pollution Control District, San Francisco, Calif., 20p., 1963. 70 refs.

'Oxidizing' air pollution, resulting from photochemical processes which occur in the atmosphere, is distinguished from 'classical' air pollution, the predominating features of which are the presence of sulfur dioxide, industrial dusts, and soot. The processes leading to the formation of photochemical smog are summarized, as are the meteorological, topographic, and solar energy factors influencing the intensity of photochemical smog episodes. Classical and photochemical air pollution may coexist. The principle effects of photochemical air pollution are eye irritation, vegetation damage, and visibility reduction. Other possible effects are also pointed out on health of acute or chronic exposure to photochemical smog and one or more of its specific components. The components include carbon monoxide, ozone, nitrogen oxides, lead, sulfur oxides, fluoride, beryllium, hydrogen sulfide, polynuclear hydrocarbons, and particulates.

8252 APTIC NUMBER 19639

Penn, Wallace O.
THE BURNING OF CO IN THE TISSUES. Preprint, New York Academy of Sciences, New York, 16p., 1970. 2 refs. (Presented at the Conference of the Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

The oxidation of carbon monoxide to carbon dioxide in animal tissues is discussed. The burning of CO by muscle seems to have no after effects. When the CO is present, it is burned; but when it is removed, the normal metabolism continues. To prove that these observations were due to the burning of CO to CO2, the differential volumeter was modified to facilitate the removal of all the gas from the experimental vessel. The gas was analyzed for oxygen so that the total oxygen used could be measured independently of the CO. The total observed decrease in volume, recorded by the movements of the index drop, could not be accounted for by the disappearance of oxygen alone. Since the only other gas present was CO, it was evident that CO was burned in the process. Animals were kept in a CO exposure chamber; CO did disappear at a measurable rate. Some CO was prepared using radioactive C(14). When this was administered to mice, the labelled carbon appeared in the CO2 produced. Several other studies on the burning of CO in the tissues are also discussed.

8253 APTIC NUMBER 19514

Fujino, T., K. Yoshida, K. Miyachi, M. Yoshii, H. Oshima, and M. Imai
STUDY OF MANAGEMENT SYSTEM OF RESPIRATORY DISEASES FROM AIR POLLUTION. (Taikiosen niyoru kokyuki shikkan no kanrihoshiki ni kansuru kenkyu). Text in Japanese. Sangyo Igaku Kenkyusho Gyoseikishu (Report Inst. Ind. Med.), no. 3:1-47, June 1, 1969.

The results of a 2-yr medical survey which was conducted to study the relationship between air pollution and respiratory disease in three polluted areas of Yokkaichi City are presented in the form of tables and graphs. The data demonstrate the effect of air pollution on humans, especially with respect to respiratory diseases. The contents are divided into two categories: one concerned with epidemiological aspects of the Yokkaichi type of air pollution, of which the major constituent is sulfur dioxide, and one concerned with clinical hematological studies. Significant findings are that the highest death rate from respiratory disease occurred in the most heavily polluted area of Yokkaichi and that the death rate has tended to increase since

the advent of a petrochemical plant. It is concluded that most cases of chronic nonspecific bronchitis are related to bronchus asthma, and that cases of lung emphysema have developed from bronchus asthma rather than chronic bronchitis.

8254 APTIC NUMBER 19146

Goethert, M. and G. Malorny
CONTRIBUTION TO THE PROBLEM OF CARBON MONOXIDE DISTRIBUTION BETWEEN BLOOD AND TISSUE. (Zur Verteilung von Kohlenoxid zwischen Blut und Gewebe). Text in German. Arch. Toxikol. (Berlin), vol. 24:260-270, 1969. 16 refs.

The uptake, distribution, and elimination of carbon monoxide were investigated in experiments with rabbits by analyzing samples of expired air, blood, and pneumoperitoneum of nitrogen set the day before. The partial pressure of CO in a pneumoperitoneum reaches equilibrium after approximately 15 hours of breathing a constant mixture of CO and air. The excretion of CO from this area also requires more than 10 hours. The less affinity the hemoglobin of individual animals has for CO, the higher the CO partial pressure in the tissues, once diffusion equilibrium has been reached. This correlation also holds true for different animal species. The competition between CO and oxygen for the receptor hemoglobin is an essential factor in the determination of the CO partial pressure in the tissues. (Author summary modified)

8255 APTIC NUMBER 19577

Goethert, M. and G. Malorny
ON THE DISTRIBUTION OF CARBON MONOXIDE BETWEEN BLOOD AND TISSUE. (Zur Verteilung von Kohlenoxid zwischen Blut und Gewebe). Arch. Toxikol. (Berlin), vol. 24:260-270, 1969. 16 refs. Translated from German. Pelov and Associates, Denver, Colo., 20p., May 13, 1970.

The concentration of carbon monoxide in the pneumoperitoneum was studied in relationship to time during and after exposure to CO-air mixtures, and compared with carboxyhemoglobin values and the CO concentration in the expired air. The equilibrium partial pressure for CO is established in the pneumoperitoneum after about 15 hours; the excretion from the deposit of nitrogen administered intraperitoneally lasts more than 10 hours. The equilibrium partial pressure for CO in the tissues of 0.212 torr during breathing amounts to 64% of the CO partial pressure in the inhaled air; when breathing at 0.708 torr, it amounts to 47%. The less affinity the hemoglobin of an animal has for CO, the higher the CO partial pressure in the tissues, once diffusion equilibrium has been achieved. It has been proved by experimentation and by applying the law of mass action that the competition between CO and oxygen for the receptor hemoglobin is an essential factor in determining the CO partial pressure of the tissue. (Author summary modified)

8256 APTIC NUMBER 21771

Grafova, G. Ya.
ON DEVELOPMENT OF CANCEROUS EPITHELIUM IN LUNGS UNDER THE ACTION OF CANCEROGENOUS AGENT. (O razvitii rakovogo epiteliya legkikh pri deystvii kantserogennogo faktora). Text in Russian. Arkh. Anatom. Gistol. i Embriol., 43(7):75-83, July 1962. 15 refs.

An experimental study on the development of cancerous epithelium in lungs was carried out. Malignancy was induced by repeated injections of 0.5% oil solution of 3,4-benzpyrene into the lungs of rats. An unusual development of the epithelial regenerate was noted, that is, its stable dedifferentiation and increased nucleo-plasmatic ratio. The latter was due to the increased metabolism in the tissue and led to more extensive contact of the modified epithelium with the vascular system. The malignant tissue extended inside the organ along the course of the blood and lymphatic vessels. Throughout the development of malignancy, the cancerous neoformation maintained its tissue nature and developed in conformity with the principal laws of histogenesis. (Author abstract modified)

8257 APTIC NUMBER 21773

Hamill, Peter V. V.
AIR POLLUTION AND CHEST DISEASE. Diseases Chest, 39(5):477-484, May 1961. 14 refs. (Presented at the American College of Chest Physicians, Silver Anniversary Meeting, Atlantic City, N. J., June 5, 1959.)

Acute smog disasters have made it clear that air pollution can cause disease and death, but the subtle effects of everyday air pollution are less well known and present a formidable challenge to medical researchers. Statistical correlations based on morbidity, mortality, and laboratory studies constitute the main directions taken to determine long-term health effects. Yet, results are not yielded comparable to those which might be expected from long-term, well-controlled prospective epidemiologic studies for which all variables except the air breathed would be eliminated. A large-scale community health study in Nashville, Tenn., by the Public Health Service represents the first venture in this field. Morbidity and mortality findings will be correlated with information from an air sampling network, while other environmental and cultural factors are standarized. The need for refined portable pulmonary function instrumentation and for more accurate definitions of asthma, chronic bronchitis, and emphysema are crucial. (Author summary modified)

8258 APTIC NUMBER 21825

Hanks, Thrift G.
ANALYSIS OF HUMAN PERFORMANCE CAPABILITIES AS A FUNCTION OF EXPOSURE TO CARBON MONOXIDE. Preprint, New York Academy of Sciences, New York, 10p., 1970. 28 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Carbon monoxide levels from traffic congestion can get high enough to have an effect on higher cerebral functions. Subjects exposed to various levels of carbon monoxide during this experiment indicated no impairment of psychomotor performance. It is possible that more highly indoctrinated subjects would react differently. The method of breath-sampling and CO measurement adopted for this study resulted in consistent, reproducible pulmonary CO values. A maximum level of carboxyhemoglobin, consistent with subject safety and probable limits of general population exposure, should be selected and tested for effects.

8259 APTIC NUMBER 21725

Herrold, Katherine M. and Lucia J. Dunham
INDUCTION OF CARCINOMA AND PAPILLOMA OF THE TRACHEOBRONCHIAL MUCOSA OF THE SYRIAN HAMSTER BY INTRATRACHEAL INSTILLATION OF BENZO(A) PYRENE. J. Nat. Cancer Inst., 28(2):467-491, Feb. 1962. 31 refs.

The effect of benzo(a)pyrene on the tracheobronchial mucosa of Syrian hamsters was studied. The carcinogen was administered by intratracheal intubation either as a suspension in an aqueous solution of polyoxyethylene sorbitan monostearate (Tween 60) or a solution in olive oil. Repeated installation of benzo(a)pyrene in Tween 60 induced papillomas and carcinomas of the trachea, main-stem bronchi, and bronchioles. The mucosa of the tracheobronchial tree also revealed a number of atypical epithelial changes. It is not known whether the changes might have progressed to tumors, had the hamsters lived longer. Histologically, some of the carcinomas resembled the squamous-cell bronchogenic carcinoma of man. Neoplastic lesions were not induced in animals that received benzo(a)pyrene in olive oil. The tumor-promoting action of Tweens and their ability to increase the permeability of mucous membranes may account for the successful induction of cancer with benzo(a)pyrene in Tween 60. (Author abstract modified)

8260 APTIC NUMBER 21785

Hitosugi, M.
AN EPIDEMIOLOGICAL SURVEY ON THE EFFECTS OF AIR POLLUTION IN TOKYO METROPOLITAN AREA. (Tokyo-to taiki osen jintai eikyo ekigaku chosa han). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):45, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

Chronic influences of air pollution on people were studied in the Tokyo metropolitan area from 1966 to 1968, mainly in October. Examinees totaled 6718 and included 5096 males and 1628 females. Little difference was shown between their places of birth, living and employment. The survey comprised an interview using question-and-answer cards, pulmonary ventilation tests, and a sputum examination. The metropolitan area was divided into 3 areas according to the severity of air pollution due to sulfur dioxide: the severely polluted area had a 0.05 ppm SO2 concentration; moderately polluted area had a SO2 concentration of 0.03 to 0.04 ppm; and the slightly polluted area had less than 0.02 ppm SO2. Morbidity with chronic bronchitis was observed in 5.9% and 3.1% of male and female examinees, respectively. Higher morbidity was noted in elderly males or people from more significantly polluted areas. Severe respiratory symptoms, persistent cough and phlegm with repeated exacerbations, or persistent cough and phlegm with reduced pulmonary function were more frequently seen in these groups.

8261 APTIC NUMBER 21797

Hodges, Thomas A., Jr.
SHORT-TERM EFFECTS OF AIR POLLUTION ON MORTALITY IN NEW YORK CITY. Environ. Sci. Technol., 4(7):589-597, July 1970. 19 refs. (Presented at the American Public Health Association Annual Meeting, 96th, Detroit, Mich., Nov. 1968.)

Mortality, air pollution, and certain meteorological factors during November 1962 through May 1965 in New York City were analyzed by multiple regression by use of the least-squares method to obtain quantitative estimates of the relationship between mortality and environmental factors. Mortality from respiratory and heart diseases for aged 64 and under, as well as ages 65 and over, was significantly related to the level of air pollution; individual categories of respiratory and heart disease mortality were strongly, moderately, or weakly related. Mortality from other causes was not significantly related. The apparent influence of the environmental factors on mortality is limited to the immediate increase in mortality that occurs on the day of increased air pollution and extreme temperature, and to a less extent, on the following day. Mortality on any given day cannot be attributed to a delayed or cumulative effect of past environmental conditions. (Author abstract modified)

8262 APTIC NUMBER 21766

Holtzman, R. B., H. F. Lucas, Jr., and F. H. Ilcewicz
THE CONCENTRATION OF LEAD IN HUMAN BONES. In: Radiological Physics Division Annual Report July 1968 through June 1969. Argonne National Lab., Ill., Radiological Physics Div., p. 43-49, 1969. 22 refs.
CFSTI: ANL-7615

Lead concentration in bone from humans whose ages ranged from newborn to 85 years increased with age at a rate of 0.6 micrograms/(g ash)/yr and to be 8.7 micrograms/(g ash) at birth. These results corroborate previous reports of increases up to age 30, and they show a continuing and similar increase in the group over 35 years of age. This rate represents an increase in skeletal content of about 4 microgram/day, which is about 1% of the daily intake. The biological half-life of lead implied from the data from this study ranges from 70 to 90 years and is longer than previously reported. Lead concentrations in the group over 30 apparently consisted of two normally-distributed populations, which may reflect differences in the cigarette smoking habits of the subjects. Further studies are required to more accurately evaluate the effects of smoking and to determine whether the accumulation of lead in adults simply reflects a long biological half-life or is caused by changing levels of lead intake. Lead concentration was determined by a spectrophotometric method in

which the bone is ashed 8 hr at 600 C and dissolved in 9 M HCL at a concentration of up to 0.2 g ash/ml. After extraction with triisooctylamine to remove interfering elements, mainly iron, the lead is determined from the absorbance at a wavelength of 271 millimicrons. Bone samples were obtained during normal surgical or autopsy procedures, and lead concentration was also determined in teeth from 29 other subjects from Chicago and neighboring regions of Illinois. (Author abstract modified)

8263 APTIC NUMBER 21941

Hosko, Michael J.
THE EFFECT OF CARBON MONOXIDE ON THE SPONTANEOUS ELECTROENCEPHALOGRAM AND THE VISUAL EVOKED RESPONSE IN MAN. Preprint, Marquette Univ., Milwaukee, Wis., Dept. of Pharmacology, and Marquette Univ., Milwaukee, Wis., Dept. of Environmental Medicine, 16p., (1970) (?). 12 refs.

To ascertain whether the visual evoked response (VER) might be a sensitive detector of carbon monoxide effect, 25 humans were exposed to CO during which the VER and EEG were monitored and correlated with the magnitude of exposure. Volunteers were exposed to CO at concentrations of less than 1, 25, 50, 100, 200, 500, and 1000 ppm for periods of one-half to 24 hours. These exposures were designed to simulate the type encountered in industry and in urban areas where CO is absorbed over a period of hours. Exposures resulting in carbosyhemoglobin (COHb) saturations greater than 20% were accompanied by changes in the VER, while COHb saturations up to 33% were not accompanied by changes in the spontaneous EEG activity.

8264 APTIC NUMBER 12490

Ichioka, M., H. Kita
EFFECTS OF AIR POLLUTANTS (1). Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):59-69, 1967. 2 refs. Translated from Japanese. 49p.

Twenty-one air pollution studies are summarized. Of the 21, 18 concern the effects of pollutants on human health, and in particular, their relationship to respiratory diseases and respiratory functions; the remaining studies deal with economic losses caused by pollution, corrosion of metals, and the adsorptive capacity of indoor surfaces for gaseous substances. Subjects covered include a method for estimating the absorptivity of the airway mucuous membrane for gaseous sulfur dioxide and nitrogen dioxide; the incidence of chronic bronchitis in polluted and unpolluted areas; effects of pollution on the pharynx and larynx of school children; effects of automotive exhausts on human health; the deposition of granular and gaseous substances in the respiratory tract; the effect of NO2 on pulmonary CO diffusing capacity and airway resistance; effects of O3 on pulmonary volume; effects of NO2 on ventilatory functions in healthy individuals; the relationship between chronic respiratory diseases and air pollution; effects of SO2 on airway sensitization; an epidemiological investigation of a pollution episode involving a sulfuric acid plant; and the effect of control measures on mortality figures for heart and respiratory diseases.

8265 APTIC NUMBER 21784

Yikura, O Y., Y. Tomita, Y. Arai, M. Wakajima, K. Jo, and J. Murano
INFLUENCE OF AIR POLLUTION TO RESPIRATORY DISEASE. (Taiki Osen to kikanshi rensoku tono kankei). Text in Japanese. (Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):58, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

Children with bronchial asthma, 376 males and 150 females, were observed under a condition of atmospheric pollution. Ages ranged from 2 to 15 years. Children were divided into one group of 370 with allergic diathesis, and another group of 156 without allergic diathesis. Under the smog warning, sixty-three children out of the first group or (17.03%) showed asthmatic attack: 11.25% out of 160 mild cases and 21.43% out of 210 moderate to severe cases. Out of the second group of non-allergic children, 14.10% had an attack under the smog warning: 5.56% out of 72 mild cases, and 20.05% out of 76 moderate cases. Thus, among the 85 children who showed an asthmatic attack under the smog warning, 74.12% had allergic diathesis and 25.88% had no allergic diathesis, showing a close relationship to allergic diathesis. Exposure of sulfur dioxide gas (50 to 250 ppm) to guinea pigs increases and allergic diathesis to SO2 through respiratory tract. The SO2 exposure group showed asthmatic conditions with the 3rd inhalation of diluted (1:100) SO2 gas, while a control group showed it with the 5th or 6th inhalation. This allergic response to SO2 gas was markedly exaggerated following the sensitization by egg albumin, and some guinea pigs died of severe anaphylactic shock.

8266 APTIC NUMBER 21659

Imai, Masayuki, Hidehiko Oshima, and Katsumi Yoshida
ON THE ALLERGIC PROPERTY OF YOKKAICHI ASTHMA. Mie Med. J., 16(3):213-220, 1967. 6 refs.

Skin and liver function tests were performed on adults with 'Yokkaichi asthma' to investigate its allergic aspects and compare it with classical bronchial asthma. Since 1955, especially since 1960, when there was a large increase in industrial activities, there has been a sudden increase of asthma-like disease in Yokkaichi, especially in the neighborhood of the Shiohama oil complex. Most patients appeared in 1961, and the number of new cases has been decreasing since then. Very low rates of positive reactions were shown to skin tests with house dust, in comparison with classical asthma patients who respond positively at from 40-80%. Those with Yokkaichi asthma showed an increase of globulins, especially of gamma-globulin, but a decrease of albumin. Inhabitants of the polluted area who have obstructive impairment showed a tendency toward an increase of beta- and gamma-globulin. Pulmonary function improved in two patients who moved away from the Yokkaichi area and in one who has lived in a charcoal-filtered air room for a year.

8267 APTIC NUMBER 19513

Imai, M. M. Oshima, Y. Takatsuka, M. Kitabata, and K. Yoshida
PRESENT STATE OF AIR POLLUTION AND MEDICAL PROBLEMS AT YOKKAICHI CITY. (Yokkaichi-shi niokeru taikicsen no genjo to sono igakuteki shomondai). Text in Japanese. Sangyo Igaku Kenkyusho Gyoseki shu (Report Inst. Ind. Med.), no. 3:48-55, June 1, 1969. 16 refs.

Yokkaichi City is recognized as an appropriate location to study the relationship between air pollution and respiratory tract diseases. While dust fall in the city shows a decrease, the proportion of its soluble components reaches nearly 50% in an industrial area. In the last 5 years the atmospheric pH level has dropped from pH 6 to pH 4, and the proportion of SO4(2-) and CA(2+) in soluble components has increased. This means that the atmospheric pH level has become increasingly acidified. Sulfurous acid gas shows two-fold increase. The high correlation between SO2 and NO2 is construed to be due to the same emission source. What is characteristic of air pollution in Yokkaichi is that sulfur constitutes a large part of the atmospheric contamination, with sulfurous mist particularly noticeable. Although measured levels of Ci and Va are not significant, the ability of these compounds to change SO2 to SO3 in the presence of atmospheric oxidants should be recognized. Medical problems reflecting air pollution in the city and including a high incidence of respiratory tract diseases are reviewed in detail. The results of a medical survey are presented in the form of tables and graphs indicating the significant relationship between air pollution by sulfur dioxide and chronic bronchitis.

8268 APTIC NUMBER 21782

Imai, Kanikichi
EVALUATION OF REMARKS ON CHEST X-RAY FILMS OF AREA RESIDENTS: THEIR RELATIONSHIP WITH AIR POLLUTION. (Chiikijumin no kyobu x-sen shoken no ichihyokaho: sono taikiosen tono kankei). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 16(10):845-851, Oct. 15, 1969. 9 refs.

Chest X-rays of 253 persons over 40 years of age and living in a relatively unpolluted area were compared with X-rays of 296 persons living in a heavily polluted area. The lightly polluted area was Isogo-ku, where sulfurous gas density is 0.92 mg/day/100 sq cm 02 and average monthly dust fall is 8.3 t/sq km. Kawasaki City was the polluted area; where sulfurous gas density is 2.87 mg/day/sq cm 02 and monthly dust fall is 19.5/sq km. The X-rays, which were classified according to the nature of the shadow, indicate the existence of a relationship between air pollution and chest troubles. Lung shadows were more prevalent among the Kawasaki X-rays, and were also correlated with increasing age. Between the two groups there was no significant difference in the number of X-rays showing shadows on the aorta. No correlation was found to exist between X-ray evidence of repiratory disease and cigarette smoking. A comparative chest X-ray study provides an objective way of confirming the relationship between air pollution and diseases of the lung or respiratory organs.

8269 APTIC NUMBER 11883

Ipsen, Johannes, Margaret Deane, and Francis E. Ingenito
EPISODIC MORBIDITY AND MORTALITY IN RELATION TO AIR POLLUTION (PART I.) RELATIONSHIPS OF ACUTE RESPIRATORY DISEASE TO ATMOSPHERIC POLLUTION AND METEOROLOGICAL CONDITIONS (PART II). Preprint, American Medical Association, 35p., 1968. (Presented at the Conference on Air Pollution Medical Research, Denver, Colo., July 22-24, 1968.)

There are four types of air pollution episodes that need special kinds of data to evaluate the association between air attributes and health problems. They are the double phenomenon; the specific epidemic with 'accepted' causality; the unique air phenomenon with [illegible] effects; and unnoticed minor episodes that occur [illegible] of air pollution that do not attain obvious catastrophic intensity. The double phenomenon occurs when abnormal polluted atmosphere and excess morbidity and mortality are so obviously causally connected that measured data is important only for the sake of scientific record. In contrast, evidence of the specific epidemic rests mostly on the clinical diagnosis of the disease; retrospective or contemporary demonstration of the agent is usually possible. To study a unique air phenomenon, such as a sustained inversion, the behavior of the same population before and after exposure is contrasted to that in a different period preceding the event. The approach to a time association study is more statistical than epidemiological in nature. Most important are continuous observations of air movements and medical data covering a sufficiently long period of daily records. Though sources of data are scarce, morbidity has several advantages over mortality as an index of health. Whichever method of studying morbidity is chosen, the result is a set of daily medical data and air measurements, the evaluation of which depends on the statistical technique and model adopted. The principles discussed are illustrated by application to two studies of the relationships between industrial absenteeism from upper respiratory infections and air pollution and meteorological data. The essential inferences drawn are that high morbidity is preceded by a week when air pollutants exceed their normal seasonal level and that the level of total pollutants correlates with seasonably low temperature, high humidity, and high wind velocity.

8270 APTIC NUMBER 19192

Kawa, Atsushi
SURVEY REPORT OF HEALTH INJURY FROM AUTO EXHAUSTS AT BUSIEST TRAFFIC SPOTS IN TOKYO. (Tokyo yasanotejutakuchi no jidoshakogai repoto). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):448-449, June 15, 1970.

The effect of motor vehicle exhausts on residents of the busiest traffic thoroughfares Tokyo was surveyed by use of questionnaries inquiring about physical condition, sensitivity to health injury from the exhausts, and degree of concern about the exhausts. The findings offer quantitative confirmation that the effect of

pollutants is as intense at 100 meters from a street as on a street. This means there was no particular difference in the dispersion of pollutants within a radius of less than 100 meters. Ninety percent of the residents of the Ohara area were disturbed by polluted air and traffic noises. To obtain relief, the residents closed doors and windows, used oxygen inhalers, moved away, or occasionally went out for fresh air. It is noteworthy that an average 82% of people questioned complained of polluted air and an average 83% of the noise. Headaches were experienced by 30% of the respondents in the past two years with rate of 36%, bronchitis by 29%, sore throats by 28%, and alimentary disorders by 24%. Other symptoms were insomnia, conjunctivitis, high blood pressure, and bronchial asthma. Most of the 130 persons who identified themselves as patients were suffering from more than two kinds of diseases. The fact that 78% of them became ill following the opening of a new road loop in 1963 underscores the detrimental effect of auto exhausts on human health.

8271

APTIC NUMBER 19159

Kehoe, Robert A., Jacob Cholak, and Robert V. Story
A SPECTROCHEMICAL STUDY OF THE NORMAL RANGES OF CONCENTRATION OF CERTAIN TRACE METALS IN BIOLOGICAL MATERIALS. J. Nutr., 19(6):579-592, June 10, 1940. 7 refs. (Presented at the Meeting of the American Chemical Society, 98th, Boston, Mass., Sept. 11-15, 1939.)

A quantitative spectrographic method of high sensitivity and precision was employed for the simultaneous determination of lead, manganese, tin, aluminum, copper, and silver in normal biological material. Lead, manganese, copper, and aluminum were present in all materials examined; tin was present in about 80% and silver in 10-20% of the samples. The mean concentrations of these metals in a liter of normal urine was below 0.01 mg for manganese and 0.078, 0.038, 0.027, 0.011, and 0.00 mg respectively for aluminum, copper, lead, tin, and silver. The mean concentration of the metals in 100 gm of normal whole blood was 0.11%, 0.025, 0.015, 0.013, 0.012, and 0.00 plus mg respectively for copper, lead, manganese, aluminum, tin, and silver. Practically all the manganese, lead, and tin were contained in the formed elements of the blood; aluminum was found almost entirely in the plasma, while copper was divided almost evenly between the two, the formed elements usually containing a slightly higher concentration. The concentrations of these metals in consecutive daily or weekly samples of urine and blood from the same individuals were not constant, but varied from sample to sample. The daily output of this group of metals in the feces was practically the equivalent of their daily intake in the diet. The wide distribution of lead was indicated by data obtained on a large number of natural materials. (Author summary modified)

8272

APTIC NUMBER 19002

Krueger, Albert Paul
BIOLOGICAL EFFECTS OF GASEOUS IONS. California Univ., Berkeley, Grant 5 RO 1 AP00002-11, 33p., June 1, 1969. 13 refs.

Mice inhaling positive hydrogen ions exhibit a rise in blood serotonin level and increased vulnerability to trauma in the pulmonary parenchyma. This is reflected in earlier morbidity and a higher cumulative mortality rate in mice infected and exposed to positive ions. Inhalation of the negative ions of oxygen and hydroxide lowers the level of serotonin in the blood and does not cause pathological changes. Air ion depletion lessens the growth rate in mice. Air ions of either charge accelerate the light-induced swelling and dark-induced shrinking of isolated chloroplasts and stimulate ATP metabolism. They also affect EDTA-induced bleaching in green barley leaves, providing some insight into possible molecular mechanisms involved in air ion action on higher plants. (Author abstract modified)

8273

APTIC NUMBER 21951

Kuchersky, R. A. and T. A. Kochetkova
HYGIENIC CHARACTERISTICS OF THE FLUXED SINTER DUST. (Gigienicheskaya Kharakteristika pyl'i Oflyusovannogo Aglomerata). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 9:44-46, 1969.

Dusts containing 1.2-10.0% calcium oxide and 3.2-4.0% silicon dioxide were introduced intratracheally into 120 rats (25 and 50 mg doses). Surviving animals were studied at intervals up to 18 months. Basic pathogenic indices were: moderately disturbed, slowly progressing bronchitis, and interstitial pneumonia. The alkaline nature of the dust also causes skin irritation. Fibrogenetic action is weakly affected due to the low SiO2 content and presence of the alkaline impurity CaO.

8274

APTIC NUMBER 21826

Longo, Lawrence D.
PLACENTAL EXCHANGE OF CARBON MONOXIDE BETWEEN MOTHER AND FETUS. Preprint, New York Academy of Sciences, New York, 35p., 1970. 17 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Maternal and fetal carboxyhemoglobin concentrations (COHb) vary as a function of endogenous carbon monoxide production of the mother and fetus, the concentration of CO in inspired air, the rate of CO exchange across the placenta, the rate of excretion of CO by the mother, and the relative affinities of maternal and fetal blood for CO as compared with oxygen. In the reported cases of CO poisoning, fetal COHb was a function of maternal COHb and the duration of placental exchange of CO. Although all but one of the infants surviving maternal CO poisoning showed evidence of brain damage, the neurological and pathological change may have resulted from oxygen lack rather than CO per se. Maternal smoking during pregnancy has been associated with fetal damage or death, but factors other than exposure may have some bearing on this. Although CO has been shown to be an enzymatic poison in high concentrations, there is no evidence that it causes injury to tissues such as the lung. It is not possible at present to separate the effects of CO from hypoxia on fetal tissues.

8275 APTIC NUMBER 19622

MacDonald, William E., William B. Deichmann, and Ernesto Bernal
SUBACUTE EFFECTS OF VAPORS OF NITRO-OLEFINS UPON EXPERIMENTAL ANIMALS. Am. Ind. Hyg. Assoc. J., vol. 24:539-540, Nov.-Dec. 1963. 12 refs.

A series of inhalation experiments were conducted to compare the subacute toxicity of several nitro-olefins in concentrations of 10 and 20 ppm under conditions of 50% and 90% relative humidity. These humidity conditions were employed since this factor is thought to affect both the degree of eye irritation and toxicity of oxidizing smogs. The nitro-olefins selected for study were 2-nitro-2-butene, 3-nitro-3-hexene, 2-nitro-2-nonene, and 4-nitro-4-nonene. Rabbits, rats, guinea pigs, and mice were exposed to the vapors of one of these compounds for six hours a day, five days a week, while an experiment was terminated after three months or when approximately half of the animals within a group had died. Each compound elicited similar signs of intoxication. These included increased flow of secretions from the eyes, nose, and mouth, dyspnea, cyanosis, peripheral vasodilatation, incoordination, loss of equilibrium, and depression of growth curves. Respiratory distress was most severe in the rabbit and guinea pig. Signs of central nervous system stimulation were seen only in the rabbit during exposure to 2-nitro-2-butene. Hematological changes observed in the rat are considered to be consistent with secondary polycythemia resulting from changes in the pulmonary epithelium. Gross pathological changes included congestion, hyperemia, edema, and, occasionally, pseudomembrane formation in the nostrils, larynx, trachea, and bronchi; and congestion, hepatization, hemorrhage, consolidation, emphysema, atelectoasis, abscess formation, and fibrosis in the lungs. The processes of consolidation, fibrosis, and abscess formation were most extensive in animals which survived three months of exposure.

8276 APTIC NUMBER 21774

MacQuiddy, E. L., Leroy W. La Towsky, J. Perry Tollman, and Alister I. Finlayson
TOXICOLOGY OF OXIDES OF NITROGEN. II. PHYSIOLOGICAL EFFECTS AND SYMPTOMATOLOGY. J. Ind. Hyg. Toxicol., 23(4):134-140, 1941. 21 refs.

The pathological physiology of acute poisoning with nitrogen oxides is discussed, in the light of experimental findings on laboratory animals and a literature survey. Dogs and cats were anesthetized with urethane, and kymographic records were made of the effects of acute NO2 poisoning on blood pressure and respiration. Animals may die from pulmonary edema, asphyxia, or pneumonitis. In death from lung edema, there is a marked concentration of blood due to loss of the fluid portion of the blood into the air spaces of the lungs. The nitrous and nitric acids formed in the lung as the nitrogen oxides reach the moist mucosa have an irritating action. Methemoglobin is a common finding in the blood of animals dying from asphyxia. The pneumonitis reaction is delayed several days from the time of exposure, and it results from bacterial growth in a lung in which resistance has been lowered by the irritating action of the gas. A drop in blood pressure was expected as it is known that nitrite is formed when NO2 reacts with water on the moist respiratory mucosa. In acute death from inhalation of nitrogen oxides the heart and respiration fail at approximately the same time. Calculated amounts of nitrite, nitrous and nitric acids formed in the lungs of a human breathing various concentrations of oxides of nitrogen are given. (Author summary modified)

8277 APTIC NUMBER 19055

Marier, J. R.
FLUORIDE RESEARCH. Science, vol. 159:1494-1495, March 29, 1968.

At the first meeting of the International Society for Fluoride Research, 32 papers dealing with dental, skeletal, cytological, diagnostic, analytical, and related factors in fluoride research were presented. Various mechanisms that may explain the anticarcinogenic effect of fluoride were discussed. It was concluded that this is due to a fluoride-induced reduction in the solubility of surface enamel apatite. Fluoride can inhibit streptococcus-induced osteolysis of alveolar bone in dental infections of pulpal origin. Chronic ingestion of alcohol may aggravate skeletal fluorosis. Crippling fluorosis has been related to the fluoride content of drinking water. The effects of aluminum lactate and aluminum sulfate in alleviating symptoms of fluorosis were studied. A daily dose of 24 mg/kg aluminum lactate reduced skeletal fluoride storage by 50%. Fluoride also caused skin lesions in the extremities and lumbosacral region. These lesions may serve as diagnostic criteria in subjects exposed to industrial fluoride emissions. Discoloration and disfiguring of vegetables were also caused by fluoride. Children in an industrial area where fluoride is emitted had decreased hemoglobin and increased erythrocyte level, with two to three times more fluoride in their teeth, fingernails, hair, and urine than children in a control area. It is recommended that research in this area continue.

8278 APTIC NUMBER 21668

Matsuura, Umeharu
EFFECT OF NUCLEIC ACID PRECURSOR ON MALIGNANT NEOPLASM. Gann (Japan. J. Cancer Res.), vol. 51:51, 1960.

The effects of nucleic acid precursor on a malignant tumor under the experimental study of nucleic acid, enzyme, and protein metabolism, are discussed. Experimental mice were divided into two groups: one was transplanted with Ehrlich carcinoma intraperitoneally, and the other subcutaneously. Several drugs, Orotic acid (O-A), Mitocymin, Glucuronic acid (G-A), and Thiotic acid (T-A), were injected into the peritoneal cavity each day after 24 hours of inoculation. In the O-A group, the life span was prolonged about 1.4 times longer than that of the control, and the weight of the subcutaneous tumor was 1/2.5 of the control after two weeks of inoculation. In the O-A group liver catalase activity was 2.5 times higher than in the control; in G-A and T-A groups the activities were between the two. Kidney catalase activity showed the same results. Liver succinic dehydrogenase activity in the control group was 2 times less than that in the

O-A group. After two weeks of inoculation, RNA showed a great difference, but there was a smaller quantity of DNA than in the control. Intracellular RNA was minimally depressed in the control. Paper electrophoretically, total protein and albumin were improved, and gamma-globulin increased in the O-A group. In the tumor-bearing mice, an increase in serum calcium, and decreases in sodium and potassium were observed, but no differences between the O-A group and the controls were seen. In the O-A group, abnormal mitoses, giant, and destroyed cells were noted at an early stage.

8279 APTIC NUMBER 21844

McFarland, Ross A.
THE EFFECTS OF EXPOSURE TO SMALL QUANTITIES OF CARBON MONOXIDE ON VISION. Preprint, New York Academy of Sciences, New York, 22p., (1970). 13 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.

Results of experiments on the effects of small amounts of carbon monoxide on visual perception are discussed. Quantities of CO inhaled during these tests varied from 25 to 100 ppm in the inspired air. The tests of visual perception involved measurements of both central (cones) and peripheral (rod) vision during 20-30 minutes of dark adaptation. Also, tests for differential light sensitivity were made on foveal vision and on visual acuity. A measureable impairment in visual function was detectable when the blood COHb concentrations reached 4 to 5%; at higher concentrations, greater degrees of impairment were measured. One of the interesting findings was that recovery from the detrimental effects of CO on the visual function lags behind the elimination of CO from the blood.

8280 APTIC NUMBER 21828

Mikulka, Peter, Robert O'Donnell, Patrick Heinig, and James Theodore
THE EFFECT OF CARBON MONOXIDE ON HUMAN PERFORMANCE. Preprint, New York Academy of Sciences, New York, 26p., 1970. 21 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

An experiment designed to examine the effects of low levels of carbon monoxide on human tracking performance, time estimation, and ataxia is described. Three atmospheric compositions including 0 ppm, 50 ppm, or 125 ppm carbon monoxide were used. Carbon monoxide at these levels had no detrimental effect on performance over three hours of exposure. It is possible that prolonged exposures to equivalent carboxyhemoglobin concentrations may have profoundly different effects on behavior. (Author abstract modified)

8281 APTIC NUMBER 21669

Mitina, L. S.
THE COMBINED EFFECTS OF SMALL CONCENTRATIONS OF NITROGEN OXIDE AND SULFUR DIOXIDE UPON AN ORGANISM. Gigiena i Sanit., vol. 27:3-8, Oct. 1962. Translated from Russian by Irene B. Sharenbroch, California State Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab., 10p., Feb. 11, 1963.

A study of the combined effect of small concentrations of nitrogen dioxide and sulfur dioxide on an organism, and the character of their combined action at these concentrations, is discussed. The combined effects of NO2 and SO2 were studied by the chronic exposure of rabbits. Also, the effects of the isolated actions of these gases at the same concentrations were studied. During the exposure and recovery period, the changes in the blood periphery and the state of phagocytic activity were studied, and deformations of the proteinatious fractions of blood serum were determined. At the completion of an experiment, pathomorphological examinations of the respiratory organs were made. A mixture of NO2 and SO2 did not cause any weight reduction. Each isolated gas caused a decrease in the hemoglobin content at the end of chronic exposure, but this effect was not observed with exposure to a mixture of the two. The action of NO2 lead to a decrease in the number of erythrocytes, while a mixture of the gases and the action of SO2 alone did not. The combined action of the gases caused some decrease in the phagocytic activity of the blood; the isolated action of NO2 and SO2 produced a considerable reduction of it. Modifications of the protein fractions of blood were not observed upon inhalation of an NO2-SO2 mixture. A mixture of NO2 and SO2 at the Maximum Allowable Concentration levels for industrial installations adversely affected the animal.

8282 APTIC NUMBER 21740

Motley, Hurley L., Reginald H. Smart, and Charles I. Leftwich
EFFECT OF POLLUTED LOS ANGELES AIR (SMOG) ON LUNG VOLUME MEASUREMENTS. J. Am. Med. Assoc., 171(11):1141-1149, 1959. 17 refs.

The breathing of smog has direct effects on the respiratory tract and the eyes, and indirect statistical effects on total mortality. The direct respiratory effects were studied in 66 volunteers, 46 of whom had chronic pulmonary emphysema. Measurements were obtained of total vital capacity, timed vital capacity, maximal breathing capacity, residual air, and rate of nitrogen washout during oxygen breathing. These were used as criteria for the improvement noted when subjects breathed air filtered through activated carbon, after breathing smoggy air or clear Los Angeles air. The most significant improvement found was the decrease in the residual air volume when subjects with emphysema breathed filtered air for 40 hours or more. The severity of emphysema was aggravated by smog. No significant changes in lung volume measurements were observed by breathing filtered air as compared to smoggy air by healthy subjects. (Author abstract modified)

8283 APTIC NUMBER 19599

Moulton, David G.
AN ANALYSIS OF ODOR INDUCED ACTIVITY IN THE OLFACTORY SYSTEM (FINAL REPORT). Pennsylvania Univ., Philadelphia, Monell Chemical Senses Center, Grant AF-AFOSR-1056-67, AFOSR 69-2633TR,

19p. 1969. 14 refs.
CFSTI, DDC: AD 695976

Analyses were made of single unit activity in the olfactory epithelium and bulb of the rat and goldfish. In goldfish, results from testing with food extracts and other compounds indicated that if low concentrations of appropriate stimuli are used, inhibition is less prevalent in the olfactory bulb than studies with higher concentrations of inappropriate stimuli might suggest. In experiments with rats, using a glass/teflon olfactometer, electronic apparatus for recordings from the olfactory epithelium, and a variety of odorants, results indicate that the evoked potentials show a progressive activity change during odor stimulation which has a clear relation to the quantity of the odor and possibly some relation to odor quality. The threshold is apparently changed at an active site by an odorant and its change is closely linked to the coding mechanism for odor discrimination at this primary center. In addition to these studies, telemetry devices and techniques were developed for recording neural impulses from freely-moving animals. In conjunction with the use of these devices, behavioral techniques were also developed for training rats and rabbits in odor detection or discrimination tasks which focus the animals' olfactory equipment on the rest odor and allow the resulting odor-induced activity to be recorded, in the form of single units, from chronically implanted microelectrodes.

8284 APTIC NUMBER 21936

Mudd, J. B. and T. T. McManus
PRODUCTS OF THE REACTION OF PEROXYACETYL NITRATE WITH SULFHYDRYL COMPOUNDS. Arch. Biochem. Biophys., 132(1):237-241, June 1969. 16 refs.

Studies to assess the proportion of oxidation and acetylation of sulfhydryl groups by peroxyacetyl nitrate were performed in an effort to elucidate the mechanism of toxicity of the peroxyacetyl nitrates found in polluted urban atmospheres. Peroxyacetyl nitrate reacts with reduced glutathione producing oxidized glutathione and S-acetyl glutathione. Reaction of peroxyacetyl nitrate with reduced coenzyme A results in the formation of coenzyme A disulfide, accounting for 35-45% of the reacted sulfhydryl. The remaining products can be separated by ion exchange chromatography and are probably higher oxidation states. There is no evidence of formation of S-acetyl coenzyme A. The distribution of products obtained by treatment of coenzyme A with peroxyacetyl nitrate is similar to that obtained by treatment of coenzyme A with hydrogen peroxide. Treatment of proteins with peroxyacetyl nitrate has not provided any evidence of acetylation of sulfhydryl groups detectable by the hydroxamate test. Intramolecular disulfide bonds are formed by treatment of reduced ribonuclease with peroxyacetyl nitrate but no evidence has been obtained in favor of formation of intermolecular disulfide bonds. (Author abstract modified)

8285 APTIC NUMBER 21790

Mudd, J. B., H. Leavitt, Alpaslan Ongun, and T. T. McManus
REACTION OF OZONE WITH AMINO ACIDS AND PROTEINS. Atmos. Environ., vol. 3:669-682, 1969. 25 refs.

The following order of susceptibility of amino acids in aqueous solutions to oxidation by ozone was found: cysteine, methionine, tryptophan, tyrosine, histidine, cystine, and phenylalanine. The other amino acids found in proteins were unaffected by ozone. The oxidations of tyrosine and histidine were dependent on pH, being greater under alkaline conditions. The oxidation of pancreatic ribonuclease by ozone resulted in a decrease in enzymic activity. The amino acid residues most affected by treatment with ozone were tyrosine and histidine. Reaction of avidin with ozone caused changes in the absorption spectrum characteristic of the oxidation of tryptophan residues. The biotin binding capacity of avidin was lost after treatment of avidin with ozone. The changes in the absorption spectrum of avidin could be prevented if biotin was bound to the avidin before exposure to ozone. (Author abstract)

8286 APTIC NUMBER 21741

Mullen, John O., Mont R. Juchau, and James R. Fouts
STUDIES OF INTERACTIONS OF 3,4-BENZPYRENE, 3-METHYLCHOLANTHRENE, CHLORDANE, AND METHYLTESTOSTERONE AS STIMULATORS OF HEPATIC MICROSOMAL ENZYME SYSTEMS IN THE RAT. Biochem. Pharmacol., vol. 15:137-148, 1966. 16 refs.

A study was conducted to elucidate the differences between various drugs and chemicals with regard to their ability to increase the hepatic drug-metabolizing enzymes activity. Studies have also been carried out on the enzyme system in microsomes which oxidizes NADPH to NADP, and on the amount of the carbon monoxide-binding pigment. All compounds studied were dissolved in corn oil and injected intraperitoneally into rats. The hepatic microsomal enzymes and the amount of CO-binding pigment in adult male rats were stimulated by 3,4-benzpyrene (BP), 3-methylcholanthrene (MC), and chlordane. Chlordane stimulated nitro reductase, NADPH oxidase, and CO-binding pigment more than BP or MC. BP and MC stimulated benzpyrene hydroxylase threefold; stimulation by chlordane was slight. Zoxazolamine hydroxylase was stimulated by all three compounds to about the same extent. It is believed that chlordane stimulates the activity of zoxazolamine hydroxylase and CO-binding pigment by mechanisms different from MC or BP. Benzpyrene hydroxylase and NADPH oxidase are thought to be stimulated by similar mechanisms by all three compounds. Chlordane and methyltestosterone stimulate hepatic microsomal aminopyrene N-demethylase activity in adult female rats. Additive stimulatory effects on these enzymes are not seen when chlordane and methyltestosterone are given together, indicating that these compounds may stimulate the drug-metabolizing pathway by similar mechanisms. (Author abstract modified)

8287 APTIC NUMBER 21821

National Academy of Sciences – National Research Council, Washington, D. C., Committee on Effects of Atmospheric Contaminants on Human Health and Welfare
EFFECTS OF CHRONIC EXPOSURE TO LOW LEVELS OF CARBON MONOXIDE

ON HUMAN HEALTH, BEHAVIOR, AND PERFORMANCE. Washington, D. C., National Academy of Sciences and National Academy of Engineering, 1969, 66p. 107 refs.

The state of knowledge concerning the effects on human health of carbon monoxide is assessed. Attention is focused on low levels of CO, such as those most commonly encountered on city streets and in traffic tunnels. Fields in which additional research is recommended include behavioral, medical, biomedical, epidemiological, and environmental. The presence of carboxyhemoglobin (COHb) restricts the oxygen-carrying capacity of the blood. COHb concentration depends upon CO concentration in the ambient air. Tests indicate cerebral impairment beyond a 2% COHb level. Bodily adaption to increased CO may occur at the cost of decreased capacity of oxygenation. Persons with pre-existing medical conditions, such as emphysema or coronary vascular disease, might be more susceptible to CO problems. Smoking causes a COHb level of approximately 5%. Techniques for the analysis of CO include gas chromatography, spectrophotometry, and infrared analysis.

8288

APTIC NUMBER 21770

Oettingen, W. F. von
MANGANESE: ITS DISTRIBUTION, PHARMACOLOGY AND HEALTH HAZARDS. Physiol. Rev., 15(2):175-201, April 1935. 147 refs.

Manganese appears to be a constant constituent of plant and animal tissue with important metabolic functions in both. It may increase the oxidase reaction in plants, and stimulate the antitoxin formation, the autolysis of the liver and the respiration of animal tissues. Its absorption from the intestinal tract is slow and incomplete under normal conditions; the degree of absorption depends on the acidity of the gastric juice and the solubility of the manganese compounds. Excretion takes place in the colon, partly with the bile, and to a moderate extent with the urine. Only large doses of oral administration to animals produce toxic symptoms which lead to gastric disturbances. Central nervous symptoms are noted with subcutaneous injections, and with intravenous administration, circulatory disturbances are observed. Manganese appears to stimulate the growth of young animals, but also causes degeneration of the liver and other organs, later also changes of the central nervous system. Workmen exposed to manganese dust may develop poisoning which resembles the lenticular degeneration of Wilson's disease. It is possible that there is a primary affliction to the liver, and that the symptoms from the central nervous system are secondary. Therapeutically, manganese compounds have been advocated in a number of conditions, but further studies and clinical observations are needed before these can be accepted. (Author summary modified)

8289

APTIC NUMBER 21657

Oshima, Hidehiko, Takao Fukui, and Natsumi Yoshida
ON THE CELLULAR EFFECTS OF P-HYDROXYAZOBENZENE UPON LYMPHOSARCOMA IN MICE. Mie Med. J., 12(1):39-42, 1962. 2 refs.

Injections of p-hydroxyazobenzene into mice with four different strains of lymphosarcoma produced damage to the tumor cells. After 2, 4 and 24 hours, percentage of each mitotic phase to total and morphologic changes were investigated on the smear preparation stained with Mayer's hematoxyline by a phase microscopy. The nuclei of most resting cells were destroyed, and large or small granules were pronounced in the affected cells. A blebbing of cytoplasm or complete disintegration of cells was observed. The action of p-hydroxyazobenzene was strengthened by oxidation with a small amount of potassium persulfate.

8290

APTIC NUMBER 19534

Petrilli, F. L., G. Agnese, and S. Kanitz
THE PRACTICAL ASPECTS OF AIR POLLUTION: STUDY OF THE RELATIONS TO HEALTH. (Aspetti pratici degli inquinamenti atmosferici: lo studio dei rapporti con la salute). Giorn. Igiene Med. Prevent. (Genoa), vol. 3:3-23, 1962. 14 refs. Translated from Italian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 32p., Nov. 20, 1969.

Attempts made to correlate air pollution data with epidemiological studies of diseases of the upper respiratory tract in Genoa, Italy are reported. Collection of air pollution data in Genoa dates back to 1961, and has repeatedly expanded to keep abreast of improved technology. With this as a point of reference, some of the difficulties of obtaining correlations are documented. Among these are population selection for investigative programs. Examples are presented of the difficulties experienced using groups of truck drivers, policemen, and school children. The most successful results were obtained using school children; for bronchitis, morbidity and disease incidence followed the very pattern anticipated for the case of relation with air pollution. There was no correlation between air pollution and other respiratory diseases. The agreement of observations made in policemen and school children under different circumstances indicate that air pollution may influence the incidence of some forms of respiratory tract diseases, particularly bronchitis. Procurement of more ample and conclusive data requires well-synchronized studies on as large a scale as possible with numerous observations and points of reference based on appropriate methods of measurement and statistical analyses. A convincing demonstration of the relationship of air pollution to health of the exposed population is the fundamental requisite to the introduction of efficient prophylactic measures. The means of prevention are not lacking but are not sufficiently used because of associated high cost and coercive measures; the lack of epidemiologic documentation of the pressing need for intervention renders the assumption of a firm and decided attitude difficult.

8291

APTIC NUMBER 19638

Preziosi
AN EXPERIMENTAL INVESTIGATION IN ANIMALS OF THE FUNCTIONAL AND MORPHOLOGIC EFFECTS OF SINGLE AND REPEATED EXPOSURES TO HIGH AND LOW CONCENTRATIONS OF CO. Preprint, New York Academy of Sciences, New York, 7p., 1970. (Presented at the Conference of

the Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

A study was conducted to determine if long exposures to the maximum allowable concentrations of carbon monoxide produce irreversible morphologic changes. An attempt was made to produce irreversible changes in the brain by applying single acute exposures to higher concentrations. All experiments were performed on dogs. In 13 of the 27 dogs, electrocardiogram, electroencephalogram, respiratory rate, the amount of carboxyhemoglobin, and oxygen saturation were determined during the acute exposures. In the remaining 14 dogs, additional recordings were made of the intra-arterial and intravenous pressures, of the pulse rate, and the spinal fluid pressures. Tissue necrosis within the brain is dependent on hypoxemia and on the location and duration of a secondary circulatory disorder in which insufficiency of the right ventricle seems to be involved. Heart muscle changes were not characteristic of CO poisoning because identical cases were found in some dogs treated with pure hypoxia. Chronic exposures to 100 ppm and 50 ppm CO may produce functional disorders and morphologic changes in the heart and brain. Based on these findings, it is suggested that exposures of man to these concentrations may not be completely harmless.

8292 APTIC NUMBER 21832

Ray, A. M. and T. H. Rockwell
AN EXPORATORY STUDY OF AUTOMOBILE DRIVING PERFORMANCE UNDER THE INFLUENCE OF LOW LEVELS OF CARBOXYHEMOGLOBIN. Preprint, New York Academy of Sciences, New York, 28p., 1970. 30 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

The results of a study to investigate and quantify the effects of low levels of carboxyhemoglobin on human performance, particularly in regard to the automobile driving task, are reported. Drivers were studied while driving an instrumented vehicle on the highway under known and controlled levels of carboxyhemoglobin. Three subjects were studied, each at three levels of CO absorption (0, 10 and 20% COHb). The resulting data indicated CO induced increases in response time to sensory detection tasks of relative velocity and taillight brightness discrimination. Other indications of the effects of CO on performance were increases in the variance of several performance measures, including velocity, headway, gas pedal reversals, and gas pedal deflection.

8293 APTIC NUMBER 21788

Reif, John S., W. Harker Rhodes, and Daniel Cohen
CANINE PULMONARY DISEASE AND THE URBAN ENVIRONMENT. Arch. Environ. Health, 20(6):676-683, June 1970. 18 refs.

The validity of radiographic examination of the chest for pulmonary disease was measured in 136 dogs from a veterinary hospital and 200 dogs from a pound. Conventional radiography, 70-mm photofluorography, and portable radiography were employed. Sensitivity exceeded 90% in hospitalized dogs, and specificity was 80.0%. In pound dogs, a significantly lower sensivity (72.5%) and insignificantly higher specificity (87.1%) were observed. No significant disadvantage was found in using portable radiography or 70-mm photofluorography in a group of 92 dogs radiographed simultaneously with one of these methods and conventional equipment. Errors in reliability of interpretation were found in terms of interindividual and intraindividual varition. Radiographic examination of the chest was a feasible and valid approach to determine prevalence rates of pulmonary disease in canine populations for comparative environmental medical research. (Author abstract)

8294 APTIC NUMBER 21789

Reif, John S. and Daniel Cohen
II. RETROSPECTIVE RADIOGRAPHIC ANALYSIS OF PULMONARY DISEASE IN RURAL AND URBAN DOGS. Arch. Environ. Health, 20(6):684-689, June 1970. 12 refs.

Chest radiographs made on 1,007 canine subjects at the University of Pennsylvania Veterinary Hospital between 1965 and 1968 were reviewed to determine whether a relationship between non-specific chronic canine pulmonary disease and the urban environment could be demonstrated. Radiographs were graded for evidence of chronic pulmonary changes without prior knowledge of the animal's age or residence. The environment was divided into urban and rural segments based upon the concentration of industrialization in the Philadelphia area and available atmospheric pollution data. No significant differences were noted in the urban-rural distribution of absent, moderate, and severe changes in younger dogs. In middle-aged and older dogs, however, significant differences appeared in the distribution of changes between environmental groups. (Author abstract)

8295 APTIC NUMBER 21733

Rokaw, S. N., H. E. Swann, Jr., R. L. Keenan, and J. R. Phillips
HUMAN EXPOSURES TO SINGLE POLLUTANTS: NO2: IN A CONTROLLED ENVIRONMENT FACILITY. Preprint, California State Dept. of Public Health, Berkeley, 13p., 1968. (Presented at the Air Pollution Medical Research Conference 9th, Denver, Colo., July 24, 1968.)

The responses of human subjects to changes of temperature, humidity, and to challenge of nitrogen dioxide at levels under 3 ppm, added to a clean air background at specific temperature and humidity settings were studied. The response of the subjects in regard to pulse rate, respiratory rate, airways resistance, thoracic gas volumes, diffusing capacity, nitrogen washout, and sputum content were measured under resting conditions, immediately after excercise, and after recovery periods. Fifty seven studies of 10 subjects were completed; there were six healthy subjects and four with pulmonary disease. Measurements of pulse and respiratory rates during exercise occasionally suggested greater stress during the challenge period; however, this was not constant in all trials for any of the subjects. Measurements of diffusing capacity were disappointing, with calculated values being unrealistic or negative. Nitrogen washout studies were quite variable, and no consistent pattern of worsening in response to

NO2 challenge could be elucidated. Subjective responses were reported sporatically, with no major symptomatology referable to the respiratory tract. There was no reported increase in expectorated secretions, no demand for medication, or other signs of respiratory effects after the challenge periods. Several factors are presented that may account for the absence of clear-cut effects in the low range of NO2 concentrations employed.

8296 APTIC NUMBER 21931

Roughton, F. J. W.
THE EQUILIBRIUM OF CO WITH HUMAN HEMOGLOBIN IN WHOLE BLOOD. Preprint, New York Academy of Sciences, New York, 23p., 1970. 19 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

A study was made to obtain a comparison of the COHb and O2Hb dissociation curves. Physiological conditions established for the purpose of this study were CO2 pressure, 40 torr; pH, 7.40; and temperature, 37 C, but with points of special accuracy both at the bottom and top of the saturation curves. Blood was obtained from five healthy male subjects. The results confirmed previous observations of the greater sigmoidicity at the bottom of the COHb curve than that obtained from the O2Hb curve.

8297 APTIC NUMBER 21875

Ruiz de Andres, Saturnino and Juan Antonio Estada
PLETHYSMOGRAPHIC STUDY OF THE RESIDUAL VOLUME IN THE FUNCTIONAL MECHANISMS OF BRONCHIOLAR OBSTRUCTION. (Estudio pletismografico del volumen residual en los mecanismos funcionales de obstruccion bronquiolar). Text in Spanish. Medicamenta, 53(473):117-181, March 1970. 11 refs.

A comparison of plethysmograph and helium diffusion values in the measurement of lung capacity is thought to have applications to the diagnosis of bronchitis, asthma and emphysema. A comparison of values obtained by the two methods in 6 normal subjects agreed substantially with the relationship noted by other authors: a slightly higher value by plethysmography, but in studies of obstructive bronchial pneumonia patients, only 45% showed significantly higher values (differing by more than 500 cc) by this method. The data are studied by means of statistical evaluation in an attempt to determine the underlying mechanism.

8298 APTIC NUMBER 21935

Saibene, Franco and Jere Mead
FREQUENCY DEPENDENCE OF PULMONARY QUASI-STATIC HYSTERESIS. J. Appl. Physiol., 26(6):732-737, June 1969. 14 refs.

The quasi-static component of hysteresis presented by the volume-pressure diagram of the human lungs was determined at very low rates of volume changes and in quasi-static conditions for three different tidal volumes: it appears to increase with the depth of the breath. Under controlled conditions of volume history the quasi-static and dynamic components of hysteresis were separated at high rates of volume change. Quasi-static hysteresis decreased as respiratory frequency increased. From these findings it would appear that during quiet breathing, the contribution of quasi-static hysteresis is probably nil. Also during exercise, since the effect due to the increased tidal volume is counterbalanced by that due to increased flow, this contribution is very small.

8299 APTIC NUMBER 21777

Saruta, M., S. Ishinishi, E. Kunitake, and Y. Kodama
EPIDEMIOLOGICAL STUDY OF AIR POLLUTION INCIDENCE RATES OF SEVERAL DISEASES RELATED TO AIR POLLUTION (1960-1965). (Kokumin-kenko-hoken shinryo kado ni yoru Yahata, Fukuoka, oyobi Asaki-shi no shippei rikanritsu no sokatsu-teki kosatsu (1960-1965). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1): 44, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

Data on the morbidity related to air pollution was shown by comparing a severely polluted area (Yahata) with less polluted areas (Fukuoka and Asaki areas) for a 6 year period. The highest morbidity of respiratory organs from (bronchitis, bronchial asthma, and pulmonary tuberculosis was observed in the Fukuoka area, the lowest morbidity an the Asaki area. An extremely high morbidity of rhinitis and/or pharyngo-laryngitis was noted in the Yahata area. Foreign bodies in the eyes were also found most frequently in the Yahata area. The highest morbidity of cancer was seen in Yahata (male) and Fukuoka (female). Cancer of the liver or bladder was most frequently seen in Yahata. These results were almost constantly seen during the 6 year observation period, indicating that inflammatory diseases of the upper respiratory organs, as well as foreign bodies in the eyes, are caused by air pollution.

8300 APTIC NUMBER 21786

Saruta, M., N. Ishinishi, E. Kunitake, and Y. Katori
RELATIONSHIP BETWEEN AIR POLLUTION AND ASTHMATIC DISEASE AMONG PRIMARY SCHOOL CHILDREN IN KITA-KYUSHU CITY (2ND REPORT): CLINICAL OBSERVATIONS. (Kita-kyushu-shi ni okeru gakudo no zensoku-yo shikkan to taiki osen tono kankei(dai 2-ho): rinsho-(teki tachiba kara.) Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):56, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

An interview type examination for manifestations of asthma was performed with 3014 elementary school pupils from both a non-polluted area (1888 pupils) and a polluted area (1126 pupils) in Kita-kyushu city. Precise physical and laboratory examinations including an eosinophilic leukocyte count, were performed on pupils with asthmatic symptoms: 130 in the non-polluted area, and 152 in the polluted area. The incidence of asthmatic pupils with or without orthopnea was higher among pupils in the polluted area than in the non-polluted area 7.0% vs. 5.2%. Severe asthmatic patients with orthopnea were, however, more frequently observed

among pupils in the non-polluted area 1.85% vs. 1.6%. Atypical asthmatic patients who showed only stridor were more frequently observed among pupils in the polluted area. Eosinophilia was more frequently seen in patients with a severe asthmatic condition, while less eosinophilic patients were seen in the polluted area.

8301 APTIC NUMBER 21787

Saruta, M., S. Ishinishi, F. Kunitake, and Y. Katori
RELATIONSHIP BETWEEN AIR POLLUTION AND ASTHMATIC DISEASES AMONG PRIMARY SCHOOL CHILDREN IN KITA-KYUSHU CITY (3RD REPORT): LABORATORY EXAMINATIONS. (Kitakyushu-shi no okeru gakudo no zensoku-yo shikkan to taiki osen tono kankei (dai 3-po): rikagaku-teki kensa seiseki kara). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1)55, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

Intradermal allergenic reactions (to house dust and candida) and respiratory function tests were performed on elementary school pupils from both non-polluted and polluted areas in Kita-Kyushu-city. Positive allergic reactions to house dust as well as to candida were more frequently noted among asthmatic pupils in the non-polluted area. Positive allergic reactions were much less observed among normal pupils in both areas. Respiratory function tests showed lower values among mild asthmatic pupils with only stridor, in the polluted area. The asthmatic reaction to air pollution may be considered somewhat different from the real bronchial asthma.

8302 APTIC NUMBER 19132

Shabad, L. M.
EXPERIMENTAL CANCER OF THE LUNG. J. Nat. Cancer Inst., 28(6):1305-1332, June 1962. 40 refs.

The induction of lung cancer by administering chemical carcinogens into the respiratory tract of experimental animals is of interest because of the increasing incidence of lung cancer in man and the need for its control, and requires investigations to test the actions of such air pollutants as exhaust gases, tobacco smoke, radioactive substances, etc. An analysis of the literature showed that experimental lung cancer has been produced only in a few instances. It is believed that the critical moment in lung cancer induction is the fixation or deposition of the carcinogen in the lung tissue. Bronchogenic cancer was induced in rats by intratracheal intubation of 6 to 10 mg of 7,12-dimethylbenz(a)anthracene with black-ink powder. These cancers were usually epidermoid carcinomas originating from metaplastic bronchial epithelium. There were also some adenocarcinomas. Both of these gave rise to metastases. Many multicentric focal proliferations, both adenomatous and metaplastic, were morphologically visible precursors of lung cancer. These proliferations usually arose in the areas of application of the carcinogens, and were unrelated to inflammation. It is emphasized that the carcinogenic hydrocarbons tested are known to be air pollutants in automobile exhausts, etc.

8303 APTIC NUMBER 21845

Sjostrand, Torgny
PROCESSES THAT INFLUENCE THE BODY CARBON MONOXIDE STORES. Preprint, New York Academy of Sciences, New York, 9p., 1970. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

The proof of an endogenous formation of carbon monoxide should be based on determinations of CO in inspired and expired air simultaneously with the settlement of the carboxyhemoglobin level or the CO store for a time long enough to determine the balance between the input and output. Several clinical examples seem to indicate a relationship between the alveolar air concentration of CO and intravital hemolysis. A series of experiments on incubation of blood under different conditions indicate that CO is formed during the catabolism of hemoglobin. Recent investigations demonstrate the close relationship between the alveolar CO-concentration and the destruction rate of the erythrocytes. Graphs from the various experiments are included.

8304 APTIC NUMBER 19553

Sklensky, Bohuslav
INDICENCE OF PNEUMOCONIOSIS IN THE ROSICE-OSLAVANY COAL MINES (RUD) AND FACTORS LEADING TO ITS QUICK DEVELOPMENT. Prakt. Lekar. (Prague), 19(3):97-102, 1967. 12 refs. Translated from Czech. National Institutes of Health, Bethesda, Md., Translating Unit, 10p., July 7, 1969.

From the data concerning 243 miners of the Rosice-Oslavany coal mines who had various forms of pneumoconiosis, the average time for the development of rtg-reticulation was 17.1 years for the mining work. The average time for the total underground work was 21.5 years. For all forms of pneumoconiosis, the average time in mining was 17.2 years, and the average time of underground exposure was 22.6 years. After 5.5 years of mining, 5% of the rtg-reticulation developed. It was estimated that 34 miners were endangered yearly by pneumoconiosis. It is recommended that miners be transferred to less dusty work sites after 17 years of mining, although it would be more proper to transfer the miners after only 5.5 years of the mining work. This requirement would meet great resistance because of the shortage of qualified miners and also in view of the fact that as a result of successful measures of the dust control commission, the dust level in RUD has been reduced more than 10 times since 1963. As long as the dust level in mining exceeds the permissible concentration, however, it is the responsibility of all health authorities to enforce a timely transfer of miners. The period of 5.5 years has another significant practical importance since it can be used for factual evaluation of the dust control measures. Several secondary factors were statistically significant in the development of pneumoconiosis among young miners, including overtime work, unqualified management of the homes of young miners, nutritional deficiencies, neglect of sports activities, and past inflammatory lung diseases. (Author summary modified)

8305 APTIC NUMBER 21949

Solomon, William P. and Jerry Cathey
POLLEN OF THE NETTLES: A POTENTIAL DETERMINANT OF INTRACTABILITY IN RAGWEED POLLENOSIS. J. Allergy, vol. 45:99, Feb. 1970.

Volumetric sampling from 1965 to 1969 has revealed the prominant occurrence of airborne urticaceous pollen at several midwestern stations from July 15 to September 1. Peak concentrations, which precede ragweed pollen by two weeks, have risen above 200 g/cu m annually. Urticaceous grains are thin-walled, readily collapsed by drying, and 11 to 14 microns in diameter when fully expanded. Field studies in Michigan suggests nettles, Urtica gracilis and Laportea canadensis, as the major sources of this pollen. Of 420 persons tested epidermally with 1:20 (weight/volume) pollen extracts, 2(+) or larger reactions developed to U. gracilis in 84 patients, and to L. canadensis in 86. Among the 108 with 1(+) or negative reactions, supplementary tests with 1:500 U. gracilis produced 2(+) or larger reactions. Nasal provocative tests were conducted in 16 subjects with late summer hayfever and 3 and 4(+) reactions to U. gracilis pollen; 11 showed positive reactions, and in 2 of these, skin and mucosal responses to nettle extracts exceeded those to short ragweed pollen. It is believed that nettle pollen causes midsummer hayfever, and that it may cause an increase in the severity of ragweed pollenosis.

8306 APTIC NUMBER 19640

Stupfel, Maurice
PHYSIOLOGICAL AND BIOCHEMICAL EFFECTS ON RATS AND MICE EXPOSED TO SMALL CONCENTRATIONS OF CARBON MONOXIDE FOR LONG PERIODS. Preprint, New York Academy of Sciences, New York, 62p., 1970. 37 refs. (Presented at the Conference of the Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Pathogen free rats and mice were exposed, 5 days a week, to 50 ppm carbon monoxide for 3 months to 2 years. During the first three months, fecundation, reproduction, growth, carbon dioxide emission, and the weight and water percentages of different organs were not modified. The exposed and control groups showed no differences in hematological data, bacteria infection and immunization, or Guerin's grafted tumor's evolution. Cholesterolimia, heart pulse rate, electrocardiogram tracings, and avoidance conditioning seemed to be slightly altered at the beginning of the exposure. During the two years' exposure, mortality and aging processes were not modified by 50 ppm CO. It is thought that placing rats in an enclosure by itself, affects body growth, heart rate, electrocardiogram patterns, and avoidance conditioning. This proves the importance of ecological factors in such long term exposures to small doses of toxic substances. (Author summary modified)

8307 APTIC NUMBER 21950

Svetlova, A. K. and S. V. Pashaukhova
ON THE ASSESSMENT OF THE FUNCTION OF THE LUNGS IN INFANTS OF THE FIRST MONTHS OF LIFE. Text in Russian. Pediatriya, 49(3):38-41, 1970. 4 refs.

The indices of the respiratory mechanism, the acid base balance in the blood, and the extent of hemoglobin oxygenation were determined in 46 patients with acute pneumonia at the age of three days to three months. During the acute period of the disease, acceleration of the breathing to overcome the aerodynamic resistance of the airways and over distention of the lungs were observed. The blood oxygenation became worse and the blood reaction shifted toward respiratory acidosis; in the most severe cases, metabolic acidosis was also present. With an improvement in the general condition, the function of the lungs also improved. (Author summary modified)

8308 APTIC NUMBER 21783

Tada, O. and K. Nakaaki
ON THE RELATIONSHIP BETWEEN ENVIRONMENTAL AND EXHALED CO CONCENTRATIONS. (Kankyo-chu oyobi koki-chu no CO no kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu. (J. Japan Soc. Air Pollution), 4(1):65, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

The concentration of exhaled carbon monoxide was measured by the Jones 20-second-breath-holding method with use of Kitagawa's CO tester (type-B). For the experimental test, the exhaled CO was measured one hour after entering and just before leaving the exposure chamber and at regular intervals thereafter. The exhaled CO concentration was influenced by the concentration in the experimental room. When the 2 hours mean CO concentration was 80 to 90 ppm, the exhaled concentration was 50 to 70 ppm, decreasing 30 to 50% of the previous concentration 30 minutes after going-out of the room. Exhaled CO was also measured in work areas, and included in the study were workers in a factory with large engines (mean CO concentration 10 ppm), in a toll booth (20 ppm CO), and in an automobile inspection room (30 to 50 ppm CO). The exhaled CO concentration was increased with an increase of environmental CO concentration, and it was significantly higher among smokers than among non-smokers. Blood carboxyhemoglobin was estimated from the exhaled CO concentration, and was calculated as 2%, 5% and 6 to 8% after the 1 hour exposure to CO with concentrations of 20, 40 and 60 ppm, respectively.

8309 APTIC NUMBER 19686

Takasaki, T., et al.
STUDY ON THE INFLUENCE OF AIR POLLUTION TO NASO-PHARYNGEAL SYSTEM, ESPECIALLY TO HOARSENESS IN THE TEACHER OF A SCHOOL. (Taiki osen no biinkoto ni taisuru eikyo kotoni gakkokyoin ni okeru shagaregoe ni tsuite). Text in Japanese. Nichidai Igaku Zasshi (Nippon Univ. Med. J.) 29(3):307-310, March 1970. 7 refs.

The effect of air pollution on the human nose and throat was investigated in terms of hoarseness of the throat. Questionnaries were computed by elementary school teachers in the Koto and

Tachikawa areas and the data were statistically analyzed. The former area is a well-documented air pollution area due to settling particles and sulfur-dioxide gas, and the latter area, which is well equipped to ameliorate public nuisances, is considered to be the control area. Elementary school teachers were used as subjects because they usually carry a full teaching load and the number of hours of teaching is fairly uniform in cross section. Twenty-eight questions pertaining to coughing, hoarseness, throat pains, susceptibility to common cold, asthma, runny nose, sneezing, shortness of breath, fatigue, headaches, cigarette smoking, and the effect on the throat of using chalk were asked. One interesting discovery was that nasal affliction is more common in non-polluted areas, and throat affliction is more prevalent in the polluted area. This is perhaps due to a difference in resistance toward air pollution between the mucus of nose and throat, and over long-term breathing of polluted air, nasal mucus possibly increased its resistance. Chi-square tests of the survey results showed that the occurrence of hoarseness among elementary school teachers is significantly higher in the Koto area than in the Tachikawa area. Smoking is an inducement to hoarseness of the throat with higher frequency of occurrence in combination with the breathing of polluted air.

8310 APTIC NUMBER 21994

Thomas, Moyer D.
NEW UNDERSTANDINGS FROM CURRENT ATMOSPHERIC POLLUTION RESEARCH. Am. J. Public Health, 49(12):1664-1669, Dec. 1959. 21 refs. (Presented at the Joint Session of the Conference of Municipal Public Health Engineers, the Conference of State Sanitary Engineers, and the Engineering and Sanitation, Health Officers, and Occupational Health Sections of the American Public Health Association, 86th Annual Meeting, St. Louis, Mo., Oct. 29, 1958.)

Though it is not known what physiological significance beyond odors may be attached to many industrial compounds, the primary task in dealing with air pollution is to recognize, qualitatively and quantitatively, the substances that comprise the pollution. Compounds that are strongly suspected of being the principle eye irritants in Los Angeles include the noncnitro olefines and possibly formic acid. The plant damaging substances that produce typical 'smog' symptoms on plant leaves as distinct from ozone symptoms are probably included in the group of peroxidized organic compounds. The great carcinogenicity of 3-4 benzpyrene, 1-2,5-6 dibenzanthracene, and 3-4,8-9 dibenzpyrene is well established. Artificial smog or ozonized gasoline, free of aromatics, but at unrealistically high concentrations, produced about three times as many total pulmonary tumors and 31 times as many multiple tumors in Strain A mice in 40 weeks as were produced in a carbon filtered control atmosphere. The effect of aerosol in increasing the resistance to the respiration due to sulfur dioxide is relatively much greater at low than at high concentrations.

8311 APTIC NUMBER 20076

Thompson, Donovan J., Michael Lebowitz, Eric J. Cassell, Doris Wolter, and James McCarroll
HEALTH AND THE URBAN ENVIRONMENT. VIII. AIR POLLUTION, WEATHER, AND THE COMMON COLD. Am. J. Public Health, 60(4):731-739, April 1970. 10 refs.

A panel, consisting of families residing in the lower east side of Manhattan, was queried weekly as to the occurence of acute respiratory symptoms. The incidence and prevalence rate of 'common colds' were compared with a set of environmental variables (particulate pollution, carbon monoxide, sulfur dioxide, temperature, relative humidity, wind velocity, barometric pressure, and solar radiation), using stepwise multiple regressions. Wide seasonal variations resulted in the regressions, and results also differed widely between incidence and prevalence of illness. A multiple correlation coefficient of 0.93 was found for the regression during spring of 1964, which lagged 72 hours behind 5 environmental variables. Common cold rates seemed to depend more on meteorologic variables than on pollutant variables, but both sets of factors influenced the regressions. The test period covered 9 seasons, from winter 1962 to winter 1965.

8312 APTIC NUMBER 21775

Towsky, Leroy W. La, E. L. MacQuiddy, and J. Perry Tollman
TOXICOLOGY OF OXIDES OF NITROGEN. I. TOXIC CONCENTRATIONS. J. Ind. Hyg. Toxicol., 23(4):129-133, April 1941. 11 refs.

Results of an experimental study are presented, involving 112 animals of five different species exposed to various concentrations of oxides of nitrogen ranging from 30 to 1000 ppm, expressed as NO2 at 25 C and 760 mm pressure. Toxicity was studied in relation to time of exposure, species of animal, and weight of animal; cats, rabbits, guinea pigs, mice, and rats were used. Determination of the NO2 concentration was made by the Orsat method followed by analysis for nitrate by the phenoldisulfonic acid method. Of the 84 animals dying, 88% died from lung edema, 6% of asphyxia, and 6% of pneumonitis. A concentration of 30 ppm NO2, on 3 hour exposure, produces no harmful effects on guinea pigs. A concentration of 55 ppm NO2, on 2 or 3 hour exposure, may or may not produce harmful effects on rats and mice, but no effects on rabbits, cats, or guinea pigs. It is rare that any species or weight of animal can stand concentrations of 100 ppm NO2 or above. Death occurs within 21 hours from a 10 minute exposure. The cat appears to be the most susceptible to poisoning by nitrogen oxides. Methemoglobin is frequently seen in the blood of animals during exposure and immediately after exposure, but it rapidly disappears when exposure ceases. A summary of the literature on the quantitative work which has been done on the toxicity of nitrogen oxides is presented.

8313 APTIC NUMBER 19215

Tsunoda, Munio
THE INFLUENCE OF AIR POLLUTION BY FLUORIDE ON THE HUMAN HEALTH. (PART 1). (Fukkabutsu niyoru taikiosen to ningen no kenko (sono 1)). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 6(7):504-508, July 15, 1970.

Air pollution by fluorides has two main aspects: the fluorides

are extremely toxic for plants, parts per billion being critical for most plants, and the fluorides are accumulated in plants. Livestock feeding on them develop chronic fluorosis. To survey the air and environmental pollution caused by fluorides around the large aluminum plant in Fukushima Prefecture, a high volume air sampler was used. Within 1 km from the factory, 5.2-14.0 mg of fluorine per 1 cu m air was observed. Secondly, a relative measurement by lime treated filter paper technique was employed. The fluorine concentration in the factory was 100 times that of the adjacent villages. A method of airborne particulates was used to monitor the fluorine concentration. In the factory premises, the particulate concentration was 70 times as dense as that in villages. The fluoride pollution of the soil and subterranean water was also monitored. Among vegetables and cereals cropped in the area, some of the green vegetables showed 10 times more fluoride content than in plants from other areas. The inhabitants of the area take in 4.2 mg fluorine daily, which is above the daily limit of 3.5 mg of an average Japanese. After the physical check-up of the inhabitants, dental fluorosis, skeletal fluorosis, and crippling fluorosis were found.

8314 APTIC NUMBER 19552

Volk, R.
CLINICAL EXPERIENCES IN THE TREATMENT OF BRONCHOPULMONARY AND IN PARTICULARLY SILICOSIS-CAUSED DISEASES. Arbeitsmedizin, 17(8):229-234, 1967. 10 refs. Translated from German. National Institutes of Health, Bethesda, Md., Translating Unit, 13p., July 16, 1969.

In the Ruhr region, chronic bronchitis and emphysematous diseases are frequently encountered, and not only in those working in the mining industries. The constant pollution of the air and certain weather conditions often lead to severe and dangerous pulmonary insufficiencies. Pneumoconioses of mining areas represent an important proportion in the production and deterioration of bronchopulmonary diseases. The results of treating 750 patients with bronchopulmonary diseases, and particularly 310 patients with silicosis, with Prondilat and Prondiletten are described. Prondilat, and Prondiletten are effective preparations for treating emphysemal bronchitis, spastic bronchitis, and pulmonary emphysema. They can also be used for silicosis of varying severity with bronchitic, bronchospastic, emphysematous, and cardiac complications. Besides the bronchospasmolytic effect, the preparations have a good secretolytic, sedatory, and antiphlogistic effect. Even in severe cases, the administration of Prondilat and Prondiletten makes it possible to reduce corticosteroid doses, or, in some cases, to stop it completely. Reference is made to the good tolerance of Prondilat with cardiac glycosides. (Author summary modified)

8315 APTIC NUMBER 19068

Weill, Hans, Morton M. Ziskind, Richard C. Dickerson, and Vincent J. Derbes
ALLERGENIC AIR POLLUTANTS IN NEW ORLEANS. J. Air Pollution Control Assoc., 15(10):467-471, Oct. 1965. 14 refs.

Outbreaks of bronchial asthma, defined by sharp peaks above the average number of emergency room visits at Charity Hospital in New Orleans, have been noted in this city since the early 1950's. These outbreaks have occurred during the summer and fall, with the months of October and November containing the most frequent and severest episodes. Early work on this problem associated emissions from spontaneous underground burning in abandoned city dumps with the high incidence and extracts for skin tests in persons involved in the asthma outbreaks. Recent investigation showed that other sources of allergenic air pollution in the city were related to the epidemics of asthma. Attention has been focused on a large public grain elevator at the Mississippi River in the southwestern portion of the city. Grain extracts have produced high percentages of positive responses in susceptible patients with low response rate found in control subjects. Persons known to have participated in these outbreaks have been characterized as being allergic; a low incidence of patients with chronic bronchitis and emphysema has been found in this group. New meteorological data regarding the outbreak periods has been collected.

8316 APTIC NUMBER 19119

World Health Organization, Copenhagen (Denmark), Regional Office for Europe
THE HEALTH EFFECTS OF AIR POLLUTION. Symp. Health Effects Air Pollution, Prague, Czechoslovakia, 1967, 78p. 59 refs. (Nov. 6-10.)

The present situation in the field of air pollution was reviewed with particular reference to its effects on human health. Also considered were the lines along which future research might most profitably be conducted, and what further progress might be made towards drawing up a series of criteria guides and standards of air quality. There is a continuing need to consider which air measurements will provide information of the greatest value to the research worker, epidemiologist, and hygienist. It is necessary to measure concentrations, not only of the common air pollutants, but also of new compounds of hitherto unknown clinical significance and of those constituting a nuisance, as well as those known to produce a hazard. Statistical advice is needed in determining the number of monitoring stations required to cover a defined area. The accumulation of pollutants in the upper atmosphere may lead to gradual changes in the earth's climate. Further research is needed to assess the importance of this problem. Air pollution may be having a long-term effect in altering the acidity of natural waters. In the past, there has been considerable emphasis on air pollutants considered as toxic substances. In many spheres the emphasis is moving away from toxicological methods. The effects of air pollutants on the body are being considered in relation to physiological and pharmacological mechanisms. The possible importance of specific sensitivities and allergies is being appreciated both in considering the acute effects of air pollution and in studying the etiology of bronchitis. An interdisciplinary approach to this subject is more than ever now needed. Not enough is known about the pathology of diseases in which air pollution is suspected of playing a part and an approach to forensic

pathologists and veterinarians may be of value. Although the publication of criteria and guides for air quality control would be useful, it was suggested that their lack not delay the establishment of air pollution control programs. The immediate problems in this field are usually obvious, and the establishment of controls can well precede the generation of guides and criteria.

8317 APTIC NUMBER 21870

Yanaga, S., K. Omori, H. Nakamura, and A. Tanizaki
EXPERIMENTAL STUDIES OF REPEATED EXPOSURE TO NO2. (NO2 hanpuku bakuro no jikken-teki kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):124, 1969. (Presented to the Japan Soc. Air Pollution, 10th Annu. Meet., 1969.)

Repeated exposure to mice and guinea pigs of nitrogen dioxide in low concentrations (1 ppm for guinea pigs and 1 or 5 ppm for mice) was performed to determine the amount of histamine within the lung, blood or other organs, and to measure its effect on body power (exhaust time). All animals were exposed to NO2 gas 3 hours/day, 5 days/week for two months. Every fifth animal was killed at certain intervals to measure the histamine with the organs. The histamine was measured by the use of a Shore's fluoro-photometer. Water in the lung was calculated by its decrease after exposure of the lung to a hot (110 C), dry condition for 24 hours. Body power was measured using an exhaust time (until the animal takes an upright position), and the time for death following a swim in the water. Histamine in the lung was increased on the 20th and 30th days among animals exposed to 5 ppm NO2 and 1 ppm NO2, respectively. Histamine in the blood was gradually increased in the 1 ppm group, while there was no change in the 5 ppm group. No significant change of water amount in the lungs of mice was noted. Slight shortening of exhaust time and death time was observed in both groups.

8318 APTIC NUMBER 19825

Yamazaki, Kazuhide, Toshijiro Mogi, Yukio Nishimoto, and Tsutomu Komazawa
EFFECT OF DIESEL EXHAUST GAS ON HEALTH OF WORKERS. PART II. MULTIVARIATE ANALYSIS OF PULMONARY FUNCTION. (Diizeru haikigasu ga shintai ni oyobosu eikyo. Dainiho haikinokensaseiseki no kaiseki). Text in Japanese. Tetsudo Rodo Kagaku (Science of Railroad Labor), no. 23:1-11, 1969. 13 refs.

Continued from Part I which included the determination of nitrogen oxides and sulfur dioxide in exhaust from diesel locomotives in tunnels and service sheds, the present study was conducted in order to investigate the effects of these emissions on the pulmonary function of railroad personnel. Employees fell into the categories of those who work in tunnels, in the service sheds, or elsewhere where the effects of gases were present. Data from the tests were subjected to multivariate analysis under various occupational and physiological categories in order to discover the significance of each item. Elements which most influence the pulmonary function of railroad workers are their age, height, and weight. The next largest factors are the items relating to the type of work, the location of work, and the degree of pollution of the place of work, surpassing the effect of smoking. The place of work only reduces the pulmonary function by less than ten percent, and the effects of gases are much larger in the service sheds rather than in the tunnels, leading to the conclusion that a better ventilation system and exhaust treatment are necessary.

8319 APTIC NUMBER 21656

Yoshida, Katsumi, Hidehiko Oshima, and Yoshikazu Takatsuka
A FURTHER STUDY ON THE ANTI-CANCER ACTION OF 4-METHYL, 2,4'-DIHYDROXY, 2'-CARBOXYAZOBENZENE AND ITS RELATED COMPOUNDS. Mie Med. J., 11(1):81-85, 1961. 2 refs.

When injected into non-inbred albino mice and rats, the substance 4-methyl,2,4'dihydroxy,2'-carboxyazobenzene exerted a degenerative effect on Ehrlich ascites tumor cells, ascites hepatoma 7974, and Yoshida sarcoma. Many azo-compounds and stilbene derivatives related with substance were tested upon Ehrlich ascites tumor. Examinations were made two, four, and 24 hrs. after injection and morphologic changes were observed by phase microscopy. The nucleus reduced in size, and blebs or blister formation of the cytoplasm also occurred. Several hydroxyazocompounds had a similar effect and the fundamental structure of compounds responsible for this degenerating action p- or o-hydroxyazobenzene.

8320 APTIC NUMBER 19512

Yoshida, K., H. Oshima, and N. Imai
AIR POLLUTION BY SULFUR ACID GAS (I). ON YOKKAICHI TYPE OF AIR POLLUTION. (Ryusanganasu niyoru taikiosen (I). Yokkaichi-gata no osen). Text in Japanese. Sangyo Igaku Kenkyusho Gyoseki shu (Report Inst. Ind. Med.), no. 3:56-68, June 1, 1969. 18 refs.

Some characteristics of Yokkaichi type of air pollution, which is a distinctive type caused predominantly by sulfur dioxide from petrochemical plants, and three problems in evaluating the air pollution are discussed with regard to respiratory disease. The first problem is whether respiratory disease is influenced more by SO2 average density or peak density. The second problem relates to the lack of discussion about atmospheric SO3, while SO3 constitutes only 3-5% of the sulfur oxides generated by oil combustion, the H2SO4-mist produced by the absorption of SO3 in atmospheric water is 20 times as noxious as SO2, and has a more severe effect. Finally, the effect of sulfur oxides on respiratory organs varies according to its state, (aerosol, gas, or mist) and to the type of physical reaction with coexisting atmospheric substances. Some findings on the relationship between SO2 pollution and chronic bronchitis in Yokkaichi city are outlined.

8321

APTIC NUMBER 21655

Yoshida, Katsumi, Hidehiko Oshima, Koji Miyata, Hiroshi Sasaki, Katsuzo Nishiguchi, Yoshikazu Takatsuka, and Hiroshi Shiomi
ANTI-CANCER ACTION OF 4-METHYL, 2,4'-DIHYDROXY, 2'-CARBOXYAZOBENZENE AND ITS RELATED COMPOUNDS. Nie Med. J., 9(2):345-350, 1959.

A variety of compounds based on 2-methyl,4,4'-dihydroxy,2'-carboxyazobenzene were synthesized and injected into Ehrlich ascites cancer bearing mice. Two, four, and 24 hours after injection, the percentage of each cell division phase to total cells and morphologic changes on the microscopic preparations were investigated and compared. The degenerated cells with pyknosis, cytolysis, and destruction of the cytoplasm and nucleus increased in number following treatment with the compound prepared by the coupling of 5-hydroxyanthranilic acid diazonium salt with m-cresol, 2,4'-dihydroxy,4-methyl,2'-carboxyazobenzene, and with the compound 1,3-bis-(4'-hydroxy,2'-carboxyphenylazo)-4-hydroxy,6-methylbenzene). The faintly staining cytoplasm was dwindled and transformed into amoeboid or chrysanthemum-shape, and its pyknotic nucleus was divided into several masses and scattered in the ctyoplasm. Particularly degeneration action was due to the substance prepared by the coupling of 5-hycroxyanthranilic acid diazonium salt with 4-iod-m-cresol, and next by deiodonation by metallic natrium in ethyl ether.

8322 APTIC NUMBER 19620

Bashirova, P. N.
CERTAIN CHARACTERISTICS OF INDUSTRIAL AND DOMESTIC CONTAMINATION OF SOIL IN CITIES OF THE KUSNETSK BASIN. (Nekotoryye pokazateli promyshlennogo i bytovogo zagryazneniya pochv v Gorodakh Kuzbassa). Text in Russian. Okhrana Prirody na Urale, vol. 5:79-82, 1966.

Analysis of soil samples taken in and near cities of the Kusnetsk Basin, a coal and metal working center, has revealed significant changes caused by various waste products. Soils were found to contain harmful elements such as lead, and to be poor in nutrient content. The natural composition of soil was found in gardens and parks where cultivation was maintained to a depth 60-130 cm. It is concluded that with proper agronomic measures, these soils can be made to support trees, shrubs, flowers, and grasses.

8323 APTIC NUMBER 21667

Boertitz, Siegfried
PHYSIOLOGICAL AND BIOCHEMICAL CONTRIBUTIONS TO SMOKE DAMAGE RESEARCH. PART I. INVESTIGATIONS INTO THE INDIVIDUALLY DIFFERENT EFFECTS OF SO2 UPON ASSIMILATION AND SOME SUBSTANCES OF NEEDLES OF SPRUCE TREES (PICEA ABIES (L.) KARST.) BY VESSEL GASIFICATION OF SOME BRANCHES IN AN OPEN AREA EXPERIMENT. (Physiologische und biochemische Beitrage zur Rauchschandenforschung. Untersuchungen ueber die individuell unterschiedliche Wirkung von SO2 auf Assimilation und einige Inhaltsstoffe der Nadeln von Fichten (Picea abies (L.) Karst) durch Kuevettenbegasung einzelner Zweige im Freilandversuch). Arbeitsgemeinschaft forst. Rauchschadenforschung Tharandt, 8(15), 1964. 27 refs. Translated from German. Belov and Associates, Denver, Colo., 20p., April 16, 1970.

Experiments were conducted to determine the differing reaction potentials of single spruce to sulfur dioxide by cell gasification on location. The gasifications were connected with gas metabolism and biochemical investigations. Predominantly 12 year old, closely adjacent spruce were chosen for the experiments. Gasification was performed on single branches under open area conditions. Two branches of the same whorl were covered with a cell of PVC foil. An SO2-air-mixture was passed through one, and pure air through the other. For an SO2 concentration of 1 ppm, the assimilation decreased. After a few hours, no further decrease was observed for a long period of time. An SO2 concentration of 3 ppm results in a stronger assimilation decrease, and may cause acute damage in the more sensitive trees. When gasification was interrupted for several days, clear phases of regeneration and redamage appeared. The sensitivity of individual trees to these reactions differed. In the area of chronic damage, no changes in coal hydrate, amino acid levels in the sap, or pH appeared for relatively short duration gasification.

8324 APTIC NUMBER 19540

Rosener, Rolf
OCCURRENCE OF BARK-BREEDING FOREST PESTS IN FUME-DAMAGED PINE AND SPRUCE-STANDS. (Zum Vorkommen Rindenbrutender Schadinsekten in rauchgeschadigten Kiefern- und Fichtenbestanden). Arch. Forstw., 18(9/10):1021-1026, 1969. 5 refs. Translated from the German. Belov and Associates, Denver, Colo.

Investigations were conducted to determine the extent to which forest plantations, which have already been weakened by industrial waste gases, were exposed to the additional danger of forest pests. The principal emitters in the areas studied were power stations using brown coal, generating large amounts of sulfur dioxide. Determinations of the insects were made at the fall cutting of the trees according to the feed zone characteristics or to the development stages. The frequency of appearance was determined by the number of tree trunks afflicted and by the breeding density of the afflicted trunks. The most significant pest occurring in the pine was Pissodes harcyniae. This pest frequency appears in such a large breeding density per tree truck that the trees die during larva-formation. The frequent occurrence of Xyloterus lineatus is significant, and it should be considered a technical pest. Hylurgops palliatus, Pityogenes chalcographus, Ips typographus, and Dryoccetes hectographus are considered secondary pests. It was determined that the density of bark-breeders is higher in highly-fume-damaged fringes than in areas with less fume damage.

8325 APTIC NUMBER 21947

Brennan, Eileen and Ida A. Leone
INTERACTION OF TOBACCO MOSAIC VIRUS AND OZONE IN NICOTIANA SYLVESTRIS. J. Air Pollution Control Assoc., 20(7):470, July 1970. 5 refs.

The response of virus-free and virus-infected tobacco plants to ozone was compared, and the effect of ozonation on the production of active virus in the plant tissue was studied. Tobacco plants were grown in sterilized soil to the six-leaf stage. At appropriate times they were inoculated with tobacco mosaic virus (TMV) so that at the time of ozonation they represented 0, 2, 6, and 12-day-old infections. All plants were exposed to 0.30 ppm ozone for 6 hours. The next day typical ozone toxicity symptoms appeared on all virus-free plants. The upper surface of the oldest leaves became necrotic and the next oldest leaves were flecked. Plants that had been infected with the virus for only 2 days also became slightly flecked, but those that had been infected for 6 to 12 days failed to develop any symptoms. Tobacco mosaic virus infected foliage had a higher respiration rate, higher nitrogen content, and lower carbohydrate content than the virus-free leaves. Ozonation did not produce the changes in the virus-infected tissue that it did in the virus-free tissue. Tests conducted on Pinto beans indicate that there is a time-dependent stimulating action of ozone on virus activity. It is recommended that a thorough study of the effect of ozone on virus development be conducted.

8326 APTIC NUMBER 19358

Compton, O. C., L. F. Remmert, and W. M. Mellenthin
COMPARISON OF FLUORINE LEVELS IN CROPS BEFORE AND AFTER ALUMINUM FACTORY OPERATIONS IN THE DALLES AREA. Oregon Agricultural Experiment Station, Corvallis, Miscellaneous Paper 95, 27p., 1960. 7 refs.

The fluorine content of seven crops in the Dalles fruit area in Oregon were studied, beginning in August, 1953. Determinations of leaf fluorine were made four times previous to and three times since July 24, 1958, when a local aluminum reduction factory began operations. Leaf samples taken before July 1958 averaged less than 12 ppm fluorine. Similar samples taken after the start of operations at the factory ranged from 16 to 197 ppm, averaging 69 ppm fluorine. The June 1959 samples ranged from 6 to 106 ppm, averaging 26 ppm fluorine; those collected in August ranged from 18 to 207 ppm, averaging 73 ppm fluorine. The fluorine samples taken in October 1958 decreased from an average 140 ppm, 1 mile from the factory to 58 ppm, 4-5 miles away. Fluorine burn on leaves was severe in 1959 on certain apricot and prune trees growing within 2 miles of the factory. Peaches collected in 1959 showed a premature ripening and softening along the suture, the swelling often extending to the apex. This condition has not been observed previously in this area. (Author summary modified)

8327 APTIC NUMBER 19124

Compton, O. C., L. F. Remmert, J. A. Rudinsky, L. L. McDowell, F. E. Ellertson, W. M. Mellenthin, and P. O. Ritcher
NEEDLE SCORCH AND CONDITION OF PONDEROSA PINE TREES IN THE DALLES AREA. Preprint, Oregon Agricultural Experiment Station, Corvallis, Miscellaneous Paper 120, 6p., 1961. 8 refs.

A survey was designed to determine the nature of the injury to pine trees growing in and around the Dalles area in Oregon. Considerable injury from 'blight', or needle scorch, was found. Scorched needles contained considerably more fluorine than unscorched needles and were typical of 'ponderosa pine blight.' In the Dalles area, the percentage of scorch in 1960 needles varied from 0.9% at Station 12, which was 8 miles south of an aluminum factory, to 67.7% at Station 4, which was 1.2 miles WNW of the factory. The fluorine contents were 23% and 98%, respectively. The greatest amount of scorch was associated with higher fluorine content. No scorch was found in samples outside the Dalles area, and these samples were low in fluorine content. There was no pathological, entomological, or soil conditions that would account for the needle scorch found in the area. (Author conclusions modified)

8328 APTIC NUMBER 21851

Delwiche, C. C.
CARBON MONOXIDE PRODUCTION AND UTILIZATION BY HIGHER PLANTS. Preprint, New York Academy of Sciences, New York, 17p., 1970. 10 refs. (Presented at the Conference on Biological Effects of Carbon Monoxide, New York, Jan. 12-14, 1970.)

Both carbon monoxide production and utilization by plants take place at significant rates and plants may serve a useful role in maintaining environment quality through the assimilation and utilization of carbon monoxide from other sources. It is possible that the cycling of CO by plants is sufficiently great to justify a re-evaluation of the comparative significance of these sources and man-made sources of CO. The mechanism of CO formation by plants under normal conditions is not known. (Author abstract modified)

8329 APTIC NUMBER 19713

AIR POLLUTION: PLANT KILLER. Environ. Sci. Technol., 4(8): 635-636, Aug. 1970.

Agricultural losses caused by increasing air pollution are estimated to reach $500 million annually in the U. S., most of the losses being due to growth suppression or plant injury. However, acute injury suggests the nature of the air pollutant and reveals the distribution of the problem. Visible effects of sulfur-dioxide injury are the bleaching of leaf areas to a light tan or ivory color or the complete bleaching of leaf. Injury from fluoride causes tissues to die at the margin and tip of the leaf. The dead tissues may be gray or light green at first, later becoming reddish-brown or tan. Typical patterns of ozone injury are bleached or light flecks or stipples on the upper surface of leaves. Injury from peroxyacetyl nitrate is characterized as glazing and browning of the lower leaf surfaces and attack of the younger leaves. A number of research programs are attempting to find a cure for pollution damage to vegetation. These programs include work on the development of crop species that are genetically resistant to atmospheric pollutants and on chemical compounds that would permit plant growth in polluted atmospheres.

8330 APTIC NUMBER 19435

Franke, Wolfgang
ON THE RELATIONSHIPS OF PLASMODESMATA TO THE ASSIMILATION OF MATTER THROUGH LEAVES. REPORT I. OBSERVATIONS ON PLANTAGO MAJOR L. (Ueber Beziehungen der Plasmodesmen zur Stoffaufnahme durch Blatter. I Mitteilung. Beobachtungen an Plantago major L.) Planta, vol. 55:390-423, 1960. 34 refs. Translated from German. Belov and Associates, Denver, Colo., 51p., Feb. 12, 1970.

The discovery of plasmodesmata in the outer walls of epidermis cells of leaves raised the problem of the physiological significance of the formations now known as ectodesmata. Their localization in the outer walls suggests they could be connections between the protoplasts and the epidermis cells or the entire living plant and the outside world. They could serve as stimulus transmitters or as a means of exchange of material from the surface of the leaf into the cell or in the opposite direction. A series of experiments was initiated to try to establish the function of the ectodesmata. The first results of these experiments are presented and discussed, including the occurrence and distribution of ectodesmata in the leaves of Plantago major, their physiological development in various methods, and relationships to the function of transport paths. Evidence is submitted establishing a

probability that the exchange of material between the surface of the leaf and the interior of the tissue takes place through the ectodesmata of the upper epidermis outer walls.

8331 APTIC NUMBER 19461

Guderian, Robert
METHODS TO DETERMINE SO2 TOLERANCE LIMITS FOR AGRICULTURAL AND FORESTRY CULTURES IN THE OPEN COUNTRYSIDE EXPERIMENTS IN BIERSDORF (SIEG). Zur Methodik der Ermittlung von SO2 Toleranzgrenzen fur land- und fur ntwirtschaftliche Kulturen in Freilandversuch Biersdorf (Sief).) Staub (Duesseldorf), 20(9):336-337, 1960. 12 refs. Translated from German by Belov and Associates, Denver, Colo.

In the area surrounding an iron ore roasting plant, an experiment was conducted in the open countryside to determine tolerance limits for rating sulfur dioxide emissions and assessing their effect on vegetation. Investigations were conducted on the relationship between SO2 content of the air and its damaging effects on agricultural and forestry cultures. Macroscopic and microscopic observations were made to determine acute and chronic damage. Growth and yield observations were also made. Kind and degree of damage were determined; characteristic damage pictures, and the time span between the SO2 effect and the appearance of the first damage are listed. Sulfur dioxide emissions were measured and continually registered by an ultragas-3-instrument. The final values will be given after all the experimental results have been obtained.

8332 APTIC NUMBER 19555

Hall, M. A. and L. Ordin
AUXIN-INDUCED CONTROL OF CELLULOSE SYNTHETASE ACTIVITY IN AVENA COLEOPTILE SECTIONS. Proc. Intern. Conf. Plant Substances, 6th, Ottawa, 1967, p. 659-671. 17 refs.

A particulate cell wall polysaccharide synthesizing enzyme system was prepared from oat coleoptiles which used UDP-glucose-C(14) to yield cellulose, and mixed beta-1,4 and beta-1,3 glucan. After treating sections with 3-indoleacetic acid (IAA), the alkali-insoluble and the alkali-soluble fractions showed an increase in C(14) incorporation at levels optimum for growth relative to untreated controls. Similar effects were observed with 2,4-dichlorophenoxyacetic acid (2,4-D). The enzyme in vitro was not affected by IAA or 2,4-D. The alkali-insoluble polysaccharide formed was qualitatively the same, regardless of auxin treatment. Auxin treatment had no effect on the levels of UDP glucose pyrophosphorylase or phosphoglucomutase in the tissue. Apparent turnover of the synthetase in untreated sections was small over the incubation period used. The results indicate that the growth-promoting activity of IAA or 2,4-D may be due to an effect on cellulose formation caused by increased production of cellulose synthetase. (Author summary modified)

8333 APTIC NUMBER 19338

Haut, Hans Van
DETERMINATION OF THE EFFECT OF SULFUR DIOXIDE ON PLANTS THROUGH LABORATORY EXPERIMENTS. (Die Analyse von Schwefeldioxydwirkungen auf Pflanzen im Laboratoriumsversuch). Text in German. Staub, (Duesseldorf), 21(2):52-56, Feb. 1961. 8 refs.

Pot plants (radishes, rye, maple, oat, beans, pine) were exposed to various concentrations of sulfur dioxide for varying periods of time. Reactions of the plant during the various stages of development, as well as the influence of various environmental conditions, were observed in separate experiments with a constant SO2/air mixture. The degree of injury was found to increase with the increase of the SO2 concentration. For example, exposure to 3 mg SO2 cu m air caused necrotic symptoms on only 2% of the leaf surface, while 12 mg SO2 damaged 77% of the leaf surface. The functional dependence of damage or the effect of concentration and exposure time can be expressed by an exponential function. Short-term high concentrations are more damaging than long-term low concentrations. Most plants displayed greater resistance at night than during the day. The damaging effect of successive concentration peaks decreases with increasing length of pollutant-free intervals. While exposure to concentration peaks in intervals of 5 min damaged 50% of a leaf, exposure in intervals of two hours damaged only 5%. In many plants the lowest resistance to pollutants was observed shortly before blossoming. Plants well nourished with nitrogen were found to be more resistant. Faded leaves due to low moisture in the soil were injured less than well-watered plants.

8334 APTIC NUMBER 19147

Hopp, H. H.
FLUORINE INJURIES TO VINE. (Fluor-bedingte Immissionsschaeden an Reben). Text in German. Die Wein-Wiss., 21(4):141-149, April 1966. 8 refs.

the vicinity of a lime kiln, injuries were observed on the leaves of the plants in the nearby vineyard in the extremely wet and cool summer of 1965. The leaves were necrotic, and the grapes had an extremely low sugar content. Measurement of the fluorine content in the medium to heavily injured leaves revealed concentrations which were 10 times higher than that of control plants. Fluorine concentration was only 8 times as high in the dead leaves as that in the control leaves, that the wash-out effect obviously becomes more apparent in entirely dead material. Since several rainy days had passed between the appearance of the symptoms and sampling, it is assumed that originally the fluorine concentrations in all samples must have been even higher.

8335 APTIC NUMBER 19322

Kotaka, Sadao and Albert P. Krueger
SOME OBSERVATIONS ON THE BLEACHING EFFECT OF ETHYLENEDIAMINETETRAACETIC ACID ON GREEN BARLEY LEAVES. Plant Physiol., 44(6):809-815, June 1969. 11 refs.

The mechanism of decolorization of isolated green chloroplasts in an ethylenediamine disodium tetraacetate (EDTA-2Na) solution was studied. Green barley leaves floated on the surface of a 0.05 M EDTA-2Na solution, and exposed to light at 25 C, showed a visible bleaching, paralleled by a reduction in the content of chlorophylls a and b. The color loss did not occur in controls treated with water instead of EDTA. In darkness, the control leaves were bleached, while the EDTA-treated leaves retained all their color. EDTA bleaching was observed only in intact leaves. When leaves were boiled, EDTA protected their pigment against photodecomposition; without EDTA, boiled leaves were completely bleached. When intact leaves, which has been floated on water and exposed to light for 48 hours, were treated with boiling ethanol or acetone, the extracted chlorophylls did not bleach if EDTA was present in solution. A green, fine grain precipitate formed which was insoluble in ethanol or acetone and stable in light or darkness. Bleaching was inhibited by potassium cyanide, and by the addition of casein hydrolysate. It is suggested that EDTA may form a complex which undergoes photodecomposition, and that the complex may be formed nonenzymatically, but the photodecomposition may be catalyzed by an enzyme. (Author abstract modified)

8336 APTIC NUMBER 21794

Lagerwerff, J. V. and A. W. Specht
CONTAMINATION OF ROADSIDE SOIL AND VEGETATION WITH CADMIUM, NICKEL, AND ZINC. Environ. Sci. Technol., 4(7):583-586, July 1970. 37 refs.

Soil samples were collected as a function of depth in profile (0-5, 5-10, and 10-15 cm) and distance from traffic (8, 16, and 32 m) at four sampling sites adjacent to heavily travelled roads. As determined by atomic absorption spectrophotometric analyses of soil extracts and plant digests, concentrations of cadmium, nickel, lead, and zinc soil and vegetation decreased with distance from the road and with depth in soil profile. High concentration of one metal in the soils did not necessarily entail high concentrations of another one of the metals. Also, there was no consistent relationship between the metal concentrations of the 0-to 15-cm soil layer and that of the vegetation growing in the soil. An approximate linear relationship over the 32-m distance existed only for Pb. Nickel and lead in roadside soils appear to be related to gasolines and Zn and Cd to motor oils and automobile tires.

8337 APTIC NUMBER 21781

Maeno, Michio
EFFECTS OF AIR POLLUTION ON TREES: REGIONAL DIFFERENCE OF SULFUR CONTENTS AND SEASONAL CHANGES OF SULFUROUS CONSTITUENTS IN LEAVES OF STREET TREES. (Junoku nitaisura taikicsen no eikyo: Gairojuyo no iouganryo no chiikisei to icukeitai no jikiteki henka). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 8(1):43-51, April 1, 1970. 9 refs.

Forty-thousand trees, representing about 24 species, growing along main roads in Yokohama and Kawasaki were surveyed. Leaves from trees in industrial areas exhibited higher external and internal concentrations of sulfur than those of trees in residential and commercial districts. Correlation coefficients between atmospheric concentrations of sulfur oxide and leaf sulfur were 0.71 and 0.42, respectively, for leaf surface and leaf interior. Sulfur in the leaves was divided into its organic and inorganic components, and these were characterized as water soluble or insoluble by means of heat separation on hydrolysis. The highest rate of water-soluble inorganic sulfur was found among tree leaves in industrial areas. Like the content of organic sulfur, it showed a seasonal variation, increasing after May. Where air pollution was noticeable, the proportion of soluble organic sulfur was higher than that of soluble inorganic sulfur. Regional variations in the types of sulfur began to be remarkable around July, the period of the physiological development of leaves.

8338 APTIC NUMBER 19701

Majernik, Ondrej and T. A. Mansfield
DIRECT EFFECT OF SO2 POLLUTION ON THE DEGREE OF OPENING OF STOMATA. Nature (London), vol. 227:377-378, July 25, 1970. 7 refs.

The stomatal behavior of five-week-old broad bean plants during exposure to simulated sulfur dioxide pollution was studied to determine whether any direct response could affect the entry of the gas to the leaf tissues. Experiments were performed with from 0.25 to 1.0 ppm SO2 and 20 C with a photoperiod of 10,000 lux. The rate of stomatal opening in light was faster in treated than in control plants, the aperture achieved during the photoperiod was considerably greater, and the stomata took longer to close fully in darkness. These stimulatory effects of SO2 on the tendency to open were reversible after 6 hr but irreversible after 3 days in an SO2 atmosphere. To reduce damage to vegetation caused by SO2-induced abnormal stomatal opening, it is suggested that inhibitors of stomatal opening might be sprayed onto foliage.

8339 APTIC NUMBER 19093

Matsushima, Jiro and Manabu Harada
SULFUR DIOXIDE GAS INJURY TO FRUIT TREES. IV. SURVEY OF SUFFERED FRUIT TREES 2. (Kaju no aryusangasu niyoru engai. (Dai 4 po). Engai no jittaichosa 2). Text in Japanese. Mie Daigaku hogakubu Gakujutsu Hokoku (Bull. of Faculty of Agriculture, Mie Univ.), no. 33:1-8, March 25, 1966. 7 refs.

Various plants have been injured in Ehime prefecture during the past few years, presumably by smoke pollution. Loquat trees in particular exhibit severe acute lesions in their leaves, which are similar to those induced in loquat trees fumigated with 33 ppm sulfur dioxide for six hours at 25 C. However, the injury to fumigated plants is less severe than the actual injury. Satsuma orange trees do not exhibit lesions, but the sulfur dioxide content of their leaves is higher than normal though not as excessive as the values reported for Wakayama prefecture. Chlorine content of Satsuma orange leaves in Ehime prefecture is

generally low. Though soil pH values in the area are low, it is inferred that both the sulfur and chlorine content of Satsuma orange leaves are related to wind direction. Plant injury in the area appears to be caused by atmospheric SO2. (Author abstract modified)

8340 APTIC NUMBER 19094

Matsushima, Jiro and Manabu Harada
SULFUR DIOXIDE GAS INJURY TO FRUIT TREES. I. COMPARISONS OF RESISTANCE OF FRUIT TREES AND EFFECTS ON LEAF FALL AND GROWTH OF CITRUS SPECIES. (Kaju no aryusanganasu niyoru engai. Dai 1 po. Kaju no teikosei narabini kankitsurui no rakuyo oyobi seiiku nioyobosu eikyo nitsuite). Text in Japanese. Mie Daigaku hogakubu Gakujutsu Hokoku (Bull. of Faculty of Agriculture, Mie Univ.), 1964:11-32, Sept. 25. 26 refs.

Various annual plants and two- and three-year old fruit trees were treated continuously in exposure chambers to 1 and 5 ppm sulfur dioxide. A short-term experiment was conducted in summer at high chamber temperature and relative humidity; in long-term winter experiments, chamber temperature and humidity were only slightly higher than atmospheric. The summer experiment showed that grape and peach trees were most sensitive to SO2, pear trees fairly sensitive, and citrus trees resistant with one exception. Tomato plants were very sensitive and rice plants moderately sensitive. Even with long-term fumigation extending over a three-week period, citrus species show no visible lesions, while most annual crops and weed plants were injured by 5 ppm within 1-7 days and some by 1 ppm within 10 to 13 days. Leaf fall of citrus species was less in winter than in summer. However, the growth of the trees was reduced by long-term exposure, suggesting that invisible injury caused by SO2 is not always negligible. (Author abstract modified)

8341 APTIC NUMBER 19344

Matsushima, J. and M. Harada
SULFUR DIOXIDE GAS INJURY TO FRUIT TREES. III. LEAF FALL OF CITRUS TREES BY BORDEAUX SPRAY BEFORE SULFUR DIOXIDE FUMIGATION. Text in Japanese. J. Japan Soc. Hort. Sci. (Tokyo), 34(4): 272-276, 1965. 11 refs.

Leaf fall of citrus trees as induced by sulfur dioxide fumigation after Bordeaux spray was studied with Satsuma and Hassaku oranges. Fumigation was conducted with 0, 1, and 5 ppm SO2 for 13 days, 2 hours a day. Half the trees on each plot were sprayed with a 6-6 Bordeaux mixture just before fumigation. In Satsuma oranges, leaves fell readily with the SO2 treatment alone, but the trend was more prominent by fumigation after the Bordeaux spray. In Hassaku oranges, leaf fall did not readily occur by the single SO2 fumigation, but was promoted by the treatment after the Bordeaux spray. In both species, the copper content of the leaves and the leaf fall rate were increased with rising concentrations of SO2 in fumigation. The Cu content was also increased by the Bordeaux spray, but it was not connected with leaf fall.

8342 APTIC NUMBER 20236

McCool, M. M. and Arnold M. Johnson
NITROGEN AND SULPHUR CONTENT OF LEAVES OF PLANTS WITHIN AND AT DIFFERENT DISTANCES FROM INDUSTRIAL CENTERS. Contrib. Boyce Thompson Inst., 9(4):371-380, 1938. 3 refs.

In addition to the investigations on soil characteristics in the Camden, New Jersey, East St. Louis, Illinois, and St. Louis, Missouri areas, growth conditions of the vegetation in them were observed. Samples of several plant species grown on several of the stations located at different distances from the centers of the cities were collected and the percentage of nitrogen, total sulfur, and sulfate sulfur were determined. The vegetation growing in the areas under observation was examined during each visit for sulfur dioxide injury; none was found. The data obtained from total sulfur and sulfate sulfur determinations were analyzed statistically with respect to distance of sampling from the various city halls. The regression coefficients on distance and odds of significance are summarized. It is concluded that the sulfur dioxide from smoke-producing areas did not adversely affect the vegetation in the Camden, East St. Louis, and St. Louis, areas. With few exceptions, the total sulfur and sulfate sulfur contents of the leaves of the plants collected did not decrease significantly with distance from the sources of SO2. Although comparatively few of the individual regression coefficients differed significantly from zero, the fact that 30 out of 34 with regard to total sulfur, and 27 out of 29 with regard to sulfate sulfur were negative in sign, shows that there is a significant decrease in sulfur content of the plants with increase in distance from the sources of sulfur dioxide.

8343 APTIC NUMBER 20171

Menser, H. A. and G. H. Hodges
NITROGEN NUTRITION AND SUSCEPTIBILITY OF TOBACCO LEAVES TO OZONE. Tobacco, 165(19):30-33, Nov. 10, 1967. 13 refs.

The relation of nitrogen nutrition to ozone susceptibility of tobacco (Nicotiana tabacum L. cv. Catterton) was investigated in a series of nutriculture and fumigation experiments. Plants grown in washed sand and irrigated with complete nutrient solutions containing 15 to 800 mg nitrogen per liter were exposed to ozone for 2.25- or 4.50-hour periods at 0.09, 0.18, or 0.36 ppm. Total nitrogen levels were determined in leaves of several maturity stages, and stomatal measurements of mature and immature leaves were obtained from acetate films of silicone rubber impressions. Ozone caused more extensive damage to plants grown with 160 mg nitrogen per liter than to plants given nitrogen in smaller or larger quantities. Ozone damage occurred in leaves that contained between 0.6 and 4.4% total nitrogen, but was most pronounced when nitrogen levels were more than 2.0%. Mature leaves experienced higher levels of ozone injury than young leaves but damage to both young and mature leaves could be intensified by increasing the ozone dose rate. On mature leaves, stomatal diameters did not differ enough to associate size of stomatal openings with the various degrees of ozone injury. (Author summary)

8344 APTIC NUMBER 20167

Middleton, John T., J. P. Kendrick, Jr., and H. W. Schwalm
INJURY TO HERBACEOUS PLANTS BY SMOG OR AIR POLLUTION. Plant Disease Reptr., 34(9):245-252, Sept. 15, 1950. 6 refs.

The area where air pollution or smog causes plant damage in the south coastal basin of southern California extends from Santa Monica to San Clemente and inland to the Redlands. Meteorological and topographical features contributing to the smog problem in this area are briefly discussed. Air pollutants consist of three types of matter: gases, aerosols, and particulate substances. When the symptoms and lists of susceptible plants are compared, it is evident that established phytotoxic agents of air pollution, such as sulfur dioxide and fluorine, are not the primary constituents causing plant damage in the air pollution of this area. Since the initial injury in most cases is in the lower mesophyll of the leaf in close proximity to the stomata, it is supposed that the pollutants causing damage are either gases or substances that act like gases. The first visible symptoms arise on the lower surface of the leaf and are the result of the air spaces left by the collapse of the protoplasts in the mesophyll layer of cells. Leaves of crop plants which have little or no pubescence and a moderate amount of cuticle developed a shiny, glazed appearance. Pubescent leaves having little or no cuticle appear somewhat bleached and lack the metallic luster. Later, these and adjacent tissues dry and the necrosis that develppes through to the top of the leaf leaves a scorched area. Occasionally the initial symptom develops on the exposed surface of the leaf, regardless of whether it is the top or the bottom side, and with no relation to the orientation of stomata. Many small necrotic spots without the associated glazing characterize this type of injury. Protected or shielded surfaces show no injury. This trouble develops only during periods of foggy weather and is attributed to a phytotoxic aerosol. As a result of a survey of eleven susceptible crops in 1949 in Los Angeles County, alone, it is estimated that the aggregate loss due to smog injury in that year was $479,495.00. The problem is serious enough to force several farming and nursery industries to move their operations to areas not affected by air pollution.

8345 APTIC NUMBER 19539

Oelschlaeger, Walter and Erwin Moser
THE EXTENT OF PLANT DAMAGE CAUSED BY GASEOUS FLUORINE AS A FUNCTION OF ENVIRONMENTAL FACTORS AS WELL AS BY PULVERULENT FLUORINE AND FERTILIZER. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(9):38-40, 1969. 9 refs.

Gaseous fluorine is the form of hydrogen fluoride and silicon tetrafluoride is the primary cause of plant damage caused by fluorine emissions. The toxic effect is governed by a number of factors including the fluorine content of air, the duration of absorption, the nature and age of the vegetation, rainfall and nutrient absorption, and fertilizers. Water conditions and nutrient supply constitute an essential factor for the necrosis caused by fluorine; at optimum nutrient supply, the resistance of forest trees to fluorine is higher. Increased light intensity and the associated high assimilation enhances the damaging effects. Soil with a high proportion of fluorine was used to grow various trees, and fly ash from an enamel shop was applied to the leaves. Solid fluorine particles were found to be less damaging than gaseous fluorine. Outside fluorine emission zones, plants can absorb large amounts of fluorine and be damaged by PK and NPK fertilizers containing boron in the BF4(-) complex.

8346 APTIC NUMBER 21990

Ordin, Lawrence, Morris J. Garber, and Juanita I. Kindinger
EFFECT OF 2,4-D ON CELL WALL METABOLISM OF PEROXYACETYL NITRATE PRETREATED AVENA COLEOPTILE SECTIONS. Physiol. Plantarum, vol. 23:117-123, 1970. 10 refs.

Avena coleoptile sections were exposed to nonlethal concentrations of peroxyacetyl nitrate (PAN). The sections were then incubated in solutions of 50 mM glucose plus 2.5 mM potassium phosphate with various concentrations of 2,4-dichlorophenoxyacetic acid (2,4-D). Growth after 4 hours was measured. A corresponding series of experiments was carried out with glucose C14(U) in the subsequent incubation medium and the effect of the 2,4-D treatments on C14 incorporation into various cell wall components was determined. Growth in the PAN-treated sections, although still partially inhibited, was greater at auxin levels normally superoptimal for growth than at the former optimum. Incorporation into all cell wall fractions was similar to growth in the case of control treated tissued. Most of the cell wall constituents, but particularly cellulose and less soluble noncellulosic polysaccharides, tended to show higher incorporation at the levels where PAN-treated growth was also higher. It was concluded that effects by PAN on cell wall metabolsim in growing tissue are similar to the effects on growth and that the mechanism of alleviation of growth inhibition is probably through decreased inhibition of wall metabolism. (Author abstract)

8347 APTIC NUMBER 21911

Pady, S. M., C. L. Kramer, and R. Clary
SPORULATION IN SOME SPECIES OF ERYSIPHE. Phytopathology, 59(6):844-848, June 1969. 18 refs.

Spore maturation and release in Erysiphe polygoni, E. cichoracearum, and E. graminis were studied in a growth chamber at 21 C, 90% relative humdity, and photoperiods of 8-12 hr. Kramer-Collins spore samplers were used to sample individual infected leaves continuously for 3-20 days. E. polygoni, a monoconidial type, produced one spore in 24 hr that was released 2-5 hr after the onset of the photoperiod, thus displaying periodicity in both maturation and release. E. cichoracearum matured spores continuously in chains through both the dark and light periods, but released them only in the light. This species has periodicity only in spore dispersal. E. graminis lacked diurnal periodicity in both spore maturation and release. Harvesting spores twice daily, and studies on spore development on individual conidiophores, gave confirming data. Under controlled conditions, light appeared to be the main factor in

spore maturation in E. polygoni and E. cichoracearum, but not in E. graminis. In darkness, E. cichoracearum had an apparent endogenous rhythm in spore release (Fig. 3), and it is probable that this is common among species with diurnal periodicity. (Author abstract modified)

8348 APTIC NUMBER 19092

Popov, B. V.
MAKING A CITY VERDANT. In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. M. Y. Huttonson (ed.), vol. 2, Silver Spring, Md., American Institute of Crop Ecology, 1969, p. 60-75. (Also: Peredovoy Opyt - Organizatsiya Zdravookhraneniya. Moskva, Meditsina, 1965, p. 67-89.)

The problems encountered in designing areas of greenery in Moscow, and the effects of air pollutants on various trees are discussed. High concentrations of acid gases in the air cause great damage to vegetation by producing burns; the prolonged action of low concentrations causes chronic damage to the physiological and biological processes of plants. Smoke-polluted air and sulfur dioxide are destructive to coniferous trees, whereas deciduous trees are generally more gas-resistant. Polluted air causes premature aging of the plant, shortens the life cycle, and lowers the resistance of trees to disease and insects. Adsorption of SO2 through the stomata disturbs the assimilation of carbon dioxide, lowers photosynthesis, inactivates the iron in the chloroplasts, heightens respiration, destroys vitamin B, disturbs the protein and carbohydrate balance, and causes silicic acid and strontium to accumulate in the leaves. To alleviate the effect of SO2 on green plantings, it is recommended that the thermal power stations be removed outside the city, and that special agro-technical practices be adopted to counteract the injurious effect of acid gases on the soil. It is also recommended that a single permissible concentration of pollutants, which is safe for vegetation, be fixed, and that a single classification of smoke- and gas-resistant trees, shrubs, and flowers be established.

8349 APTIC NUMBER 19509

Rich, Saul, Paul E. Waggoner, and Harley Tomlinson
OZONE UPTAKE BY BEAN LEAVES. Science, 169(3940):79-80, July 3, 1970. 8 refs.

The ozone uptake by bean leaves was measured; the data obtained were converted to resistance to ozone, and the resistance was compared to water vapor loss. The rate of ozone removal was measured as the time required for the concentration to decline from 200 to 150 ppb within a closed, illuminated, 75-liter chamber equipped with a fan. The observed removal of ozone by a particular leaf was proportional to leaf area, and inversely proportional to chamber volume. Several equations for the rate of ozone depletion are given. The stomata were primarily involved in controlling ozone uptake. When observations were taken as the stomata opened or closed, the resistances measured by promoter or by ozone uptake were very similar. The near equality of the resistances indicates that ozone and water vapor level travel the same path, but in opposite directions. The equality also implies that ozone is reduced to a low concentration at surfaces of the substomatal cells. The close relationship between the factors regulating ozone uptake and transpiration help explain the fact that the degree of ozone injury to tobacco could be correlated with ambient concentrations of ozone only when adjustments was made for the ratio of transpiration to atmospheric water demand. This adjustment is seen as an index of stomatal opening and a confirmation of the stomatal control of ozone uptake.

8350 APTIC NUMBER 19460

Scheffer, Fritz, Eberhard Przemeck, and Werner Wilms
INVESTIGATIONS PERTAINING TO THE INFLUENCE OF AIRBORNE DUST COMING FROM CEMENT FURNACES ON SOIL AND PLANTS. (Untersuchungen uber den Einfluss von Zementofen-Flugstaub auf Boden und Pflanze.) Staub (Duesseldorf), 21(6):251-254, 1961. 8 refs. Translated from German by Belov and Associates, Denver, Colo.

The effects of cement furnace dusts on plants and soil were investigated. Barley, German weidel grass, sugar beets, and Hungarian red clover were used in the experiments. No damage to the plants was observed over a two-year period. The soil pH increased, and during the second year, when the cement dust had a high potassium content, its lactate soluble K20 content increased with increasing dust quantity. Barley showed a small decrease in yield with increasing dust. For the German weidel grass and Hungarian red clover, the increased alkalinity caused by the dusting process had a favorable effect on the mass yield. Sugar beets also showed an increased mass yield, and the plant contents remained unchanged. The possibility exists of an indirect influence on plant yield and the substances contained in the plants by the soil and by changes in the soil reaction and nutrient. Under certain circumstances this may lead to impairment of plant production. The dust sedimented in the vicinity of cement factories appears to have no immediate danger for plants as long as its influence can be counteracted at the right time. The best counteraction can be achieved by the application of physiologically acid fertilization.

8351 APTIC NUMBER 20169

Sechler, Dale and D. R. Davis
OZONE TOXICITY IN SMALL GRAIN. Plant Disease Reptr., 48(12): 919-922, Dec. 15, 1964. 8 refs.

Plants of 72 varieties representing five small grain species were exposed to ozone concentrations ranging from 0.05 to 0.34 ppm. In descending order of susceptibility to ozone damage, the plants were hexaploid oats, diploid oats, rye, wheat, and barley. Varietal differences within the species in sensitivity were noted for both oats and rye. Symptoms of injury ranged from a faint discoloration at the leaf tip to complete leaf burn. Large scald spots frequently occurred in oats, usually starting where there was a bend in the leaf. Plants were injured at all stages of plant development, although they appeared slightly more sensitive at the three-leaf and boot stages of plant development than at

more intermediate stages. (Author summary)

8352 APTIC NUMBER 20146

Shcemyen, Janos
OZONE, SOIL MOISTURE, MATURITY LEVEL: INTERACTION CAUSES WEATHER FLECK ON SHADE TOBACCO. Sunshine State Agr. Res. Rept., 1967: p. 8-9, May 1967.

Severe episodes of ozone-induced weather fleck in 1965 and 1966 caused heavy damage to Florida shade-grown tobacco corps. Ozone had previously been identified as the cause of this leaf malady, and damaging concentrations were attributed to the photochemical action of ultraviolet light on hydrocarbons from industrial and automotive emission sources in surrounding metropolitan areas. Studies of injured leaves showed that fleck occurred 24 to 36 hours after the initial rise in ozone levels. Only leaves at certain positions on the stalk or at certain maturity levels were damaged; both immature and over-mature leaves escaped damage. The extent of fleck damage on plants receiving different rates of supplemental irrigation showed that heavily watered plots were much more prone to fleck damage, although the reasons for this effect are not yet fully understood.

8353 APTIC NUMBER 21998

Sinclair, W. A. and A. C. Costonis
OZONE INJURY TO EASTERN WHITE PINE. Arborist's News, 32(7): 49-52, July 1967. (Presented at the joint meeting of the New England Chapter, International Shade Tree Conference, and the Maine Arborists' Association, Portland, Maine, March 31, 1967.)

The great majority of white pines are relatively tolerant of ozone, but a very small percentage are so sensitive that they are severely injured each year, seldom attaining great age or size. They are further characterized by dwarfed and conspicuously burned and/or chlorotic foliage that is retained only a single year instead of the normal 27 months. Trees of intermediate sensitivity usually display near normal growth rates and needle sizes, but their needles may appear somewhat chlorotic and/or mottled with chlorotic spots, tending also to be cast prematurely. The foliage of such trees may display conspicuous tipburn in some seasons, but seldom in two successive years. Acute injuries are caused by exposure of sensitive foliage to unusually high concentrations of ozone for a few hours or less, while chronic injury is the result of daily exposure to lower concentrations of ozone, insufficient to cause distinct lesions but sufficient to cause some intensification of existing symptoms and presumably to reduce the photosynthetic efficiency of sensitive trees. An inconspicuous flecking, visible only under magnification, appears to radiate from individual stomata located in the sensitive zone 10-20 mm from the needle sheath. In microscopic view, the flecks are caused by the collapse of individual mesophyll cells adjacent to the stomata. The collapse of additional cells may occur if the injury is moderate, leading to the external appearance of yellowish to pinkish spots on the stomatal surfaces of the needles; if the injury is still more severe, the spots may become obviously necrotic and enlarge to form dead bands that widen toward the needle tips, causing tipburn. High temperature, bright sunlight, and rapid air movement appear to accentuate symptom development. Moisture on pine foliage enhances the effect of the toxicant and causes 'water spots' different from the lesions induced on dry foliage.

8354 APTIC NUMBER 19551

Vogl, Michael
PHYSIOLOGICAL AND BIOCHEMICAL CONTRIBUTIONS TO SMOKE DAMAGE RESEARCH. (Physiologische und Biochemische Beitrage zur Rauchschadenforschung). Biol. Abl., no. 5:587-594, 1964. 19 refs. Translated from German, Belov and Associates, Denver, Colo., 13p., May 6, 1970.

The assimilation and acceptance of sulfur dioxide was measured in three year old potted pines. The SO2 absorption and carbon dioxide metabolism of the plants were measured continuously and simultaneously by an ionoflux and a UPAS instrument. Gasification with SO2 initially lead to a depression of the net assimilation and the SO2 absorption. For slightly physiologically damaged needles, darkening led to a strong depression of SO2 acceptance; however, it was not completely stopped. If gasification was discontinued, a fast recovery of assimilation took place. In more severely damaged needles, the SO2 absorption occurred independent of the net assimilation for young pines. The assimilation was retarded only by true, visible damage to the needles. (Author summary modified)

8355 APTIC NUMBER 19604

Webster, C. C.
THE EFFECTS OF AIR POLLUTION ON PLANTS AND SOIL. London, Agricultural Research Council, 1967, 53p. 198 refs.

Recent trends in the emissions and concentrations of smoke, deposited matter, and sulfur dioxide in Britain and the effects of these pollutants on plants and soil are presented. Factors affecting the action of sulfur dioxide on plants are susceptibility of different species and varieties, stage of growth, time of day, environmental conditions, concentration of gas and time of exposure, intermittent exposure, and fluctuating concentration of gas. The effects on plants and soil of fluorides and photochemical or oxidant smog are considered. The contamination of plants near highways with lead from the exhaust fumes of motor vehicles is included. Plants as indicators of pollution are also discussed.

8356 APTIC NUMBER 19556

Weigl, Josef and Hubert Ziegler
THE SPECIAL DISTRIBUTION OF 35S AND THE VARIETY OF THE MARKED COMPOUNDS IN SPINACH LEAVES AFTER GASING WITH 35SO2. (Die raumliche Verteilung von S und art der markierten Verbindungen in Spinatblatterr nach Begasung mit SO2). Planta, vol. 58: 435-447, 1962. 21 refs. Translated from German. Belov and

Associates, Denver, Colo., 18p., Feb. 17, 1970.

Investigations were conducted on the special distribution of S(35) in spinach leaves after exposure to 50 ppm SO2 (35). For experimentation with radioactive gases, a device was constructed consisting of a Handschuhkasten and a gas chromatograph. This device permitted safe handling of the radioactive gases. An electrophoretic method for separating sulfites, sulfates, and sulfurous amino acids, and N-Ethylmaleinimide compounds with amino acid containing sulfur is given. The SO2 was detected by gas chromatography. The distribution of S(35) in the spinach leaf after exposure to SO2(35) was studied microautoradiographically. After seven hours of exposure, a 2- to 5-fold enrichment of S(35) in the guard cells of the pore openings was observed with respect to the remaining epidermal cells. A portion of the S(35) also entered the vascular paths. The chemical distribution of S(35) was also studied. The result was the rapid installation into cysteine, glutathione, and unknown soluble and insoluble sulfur compounds. The oxidation of sulfite to sulfate also occurred. The results are discussed with respect to the mechanism of the toxicity of SO2. (Author summary modified)

8357 APTIC NUMBER 19510

Weinstein, Leonard H. and Delbert C. McCune
FIELD SURVEYS, VEGETATION SAMPLING, AND AIR AND VEGETATION MONITORING. In: Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas. Jay S. Jacobson and A. Clyde Hill (eds.), Pittsburgh, Pa., Air Pollution Control Assoc., 1970, p. G1-G4. 31 refs.

Controlled fumigations have provided information on the appearance and consequence of air pollutant effects on plants. A practical use of these experimentally-derived data is their use with field surveys, vegetation sampling, and monitoring, and ambient air monitoring in the evaluation and prevention of pollutant injury. The field survey is the most valuable means of periodically assessing the status of vegetation in areas where air pollution is a potential or real problem. The survey must be carried out systematically so that it relates directly to the problem and yields the maximum amount of useful information. In some areas, vegetative sampling has given a general and relative index of pollution. It has also been used to monitor the accumulation of toxic or potentially toxic pollutants in crops. Atmospheric monitoring may be the only rapid and sensitive method for detecting and preventing potentially harmful pollutant levels. The importance of air sampling information demands that care be exercised in selecting equipment, sites, and procedures. Valuable information may also be obtained from biological monitors. However, these monitors are after-the-fact, and confirm that injury has already occurred without revealing the more specific nature of the episode.

8358 APTIC NUMBER 19211

Yamazoe, Fusio
EFFECTS OF HYDROGEN FLUORIDE ON PLANTS. (Fukkasuiso no shokubutsu nioyobosu eikyo nitsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(7):515-520, July 15, 1970. 8 refs.

Symptoms of fluorosis in plants are chlorotic markings around the tip or edges of young leaves. Examples of damage to plants and livestock by fluorides are listed, including the retarded growth of silkworms fed on mulberry leaves polluted by more than 30 ppm fluorides. Plants can be classified into six groups according to their resistance to hydrogen fluoride. Theshold values of the fluoride concentration range from 5-10 ppb for the plants. Gladiolus is normally employed as a plant indicator for hydrogen fluoride and silkworms as indicator insects. The relationship between plant damage by fluorides and exposure time, density, soil, fertilizer, meteorology and location are examined. The mechanism of the damage is also analyzed. In a cicolous plant, Si-F bond, which is rather difficult to dissolve in water, is formed. In a calcicolous plant, on the other hand, a Ca-F bond, which is difficult to dissolve, is formed. In evaluating plant damage, 100 g of leaves are collected from several locations in an area. After rinsing by water, the sample is dried for 30 min at 90-100 C, and subsequently at 60-70 C for several hours. The sample is powdered, screened by 1 mm screen, and subjected to chemical analysis. Several preventive measures are listed, including the spraying of water or lime on plant leaves. It is concluded that the establishment of an environmental standard is difficult because of the extremely high sensitivity of the plants to the gas.

8359 APTIC NUMBER 19485

Blachowicz, Elzbieta, Hanna Rycerska-Lazecka, and Jerzy Zawadzki
INFLUENCE OF THE CONDITION OF A STEEL SERVICE AND ITS METHOD OF PREPARATION ON THE PRESERVING POWER OF A PAINT COATING TESTED OVER AN 18-MONTH PERIOD OF EXPOSURE. (Wplyw stanu powierzchni stali oraz metod jej przygotowania na zachowanie sie powlok malarskich w okresie 18 miesiecy ekspozycji). Text in Polish. Prace Inst. Mech. Precyzyjnej, 16(2):30-37, 1968. 21 refs.

Steel samples coated with various types of protective paints were exposed in the Warsaw area, and the results analyzed. For the purposes of the experiment, the sulfur dioxide content of the atmosphere was also measured over the 18-month period during which the test was conducted. The average summer concentration of SO2 was 0.10 mg/cu m, while the winter concentration was 0.17 mg/cu m.

8360 APTIC NUMBER 19813

Goodwin, J. E., W. Sage, and G. P. Tilly
STUDY OF EROSION BY SOLID PARTICLES. Proc. Inst. Mech. Engrs. (London), 1969-1970:279-292. 19 refs.

The influence of the impacting velocity and the nature of dust particles on the erosion of different materials was studied with a vacuum whirling arm rig. The most important characteristics of natural sand were found to be the size distribution and percentage of quartz present. For artificial abrasives used in industrial processes, erosion can be related to the hardness and sharpness of the particles. Tests of quartz on nylon and steel indicate that comparatively little damage is caused by particles up to approximately 5 microns but that larger sizes cause successively more damage until a saturation condition is reached. The dependence of erosion on particle size is most important for the design of filter systems for helicopters and other vehicles whose engines suffer through ingestion of dust. Erosion depends also on a simple power of velocity. For small particles the exponent is 2.0; for particles larger than approximately 100 micrograms, it is 2.3 for a wide range of conditions. Eroding particles incur a substantial degree of fragmentation which is dependent on the initial size and the velocity of the impact. It is suggested that the extent of fragmentation as well as the properties of the target material are important in determining the erosion behavior. In comments appended to the article, other investigators suggest that the erosion rate of stainless steel from silica or ash particles varies with angle of incidence, the angle for maximum erosion increasing progressively from 35 to 50 deg as mean particle size decreases from 11 to 3 microns. The authors, while agreeing to a relation between impact angle and erosion, reply that the particle size and velocity effects observed by them seem to occur irrespective of angle.

8361 APTIC NUMBER 21979

Haynie, Fred H. and James B. Upham

EFFECTS OF ATMOSPHERIC SULFUR DIOXIDE ON THE CORROSION RATE OF ZINC. Preprint, National Air Pollution Control Administration, Durham, N. C., Materials Branch, 11p., March 1970. 10 refs.

In 1961, continuous air monitoring facilities were established in eight cities. The recordings of these data offered an excellent opportunity to correlate corrosion rates of metals with atmospheric sulfur dioxide levels. For this reason, in 1962 a 5-year program to study the corrosion of metals was started in these eight cities. Zinc panels were cleaned and mounted on exposure racks on porcelain insulators facing south and inclined at a 30-degree angle. A total of 25 panels were exposed at each site. Five panels were removed at the end of each exposure period. Periods of 4, 8, 16, 32, and 64 months were used. Corrosion products were removed in the laboratory and corrosion losses determined by weighing. Rural sites within each area, assumed to have the same meteorological conditions but lower pollution levels, were selected as controls for the urban sites. No SO2 measurements were made at the rural sites. Corrosion rates were generally higher at urban sites than at rural sites. Corrosion rates were generally higher at urban sites than at rural sites. However, at San Francisco, Cincinnati, and New Orleans, the corrosion rates were initially higher at the rural sites and converged with time. In Philadelphia, the corrosion rates at the rural site were exceptionally high but not as high as at the urban site. Estimates of SO2 at the rural sites were revised to conform to the amount of corrosion observed. It was concluded that atmospheric sulfur dioxide concentration is the major factor in controlling the corrosion rate of zinc, and that the sulfur dioxide concentration can be estimated from average zinc corrosion rates and average relative humidities.

8362 APTIC NUMBER 19430

Haynie, F. H.
STATISTICAL PLANNING AND ANALYSIS OF CORROSION TESTS. Preprint, American Society for Testing and Materials, Philadelphia, Pa., Electrochemical Society, Inc., New York, National Association of Corrosion Engineers, Houston, Tex., 49p., 1970. 14 refs. (Presented at the Symposium on State of the Art in Corrosion Testing, 1970.)

With the advent of rapid introduction of remote computer terminals and programmable electronic calculators, the drudgery of calculation no longer need be a barrier to using statistical methods of planning and analysis of corrosion experiments. The remaining barrier is the lack of understanding of statistical techniques. Basic terminology is discussed in some detail so that the engineer will be able to communicate with the statistician. Four of many possible statistical techniques used in experimental design are introduced: (1) comparison of two samples from different populations, (2) a design to study the effects of one variable at several levels, (3) orthogonal squares, and (4) factorials. The advantages and disadvantages of each are discussed and some examples are presented. A hypothetical problem is posed and then solved using several of the techniques that have been introduced. (Author abstract)

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8363 APTIC NUMBER 19491

Niskanen, Eric and U. Martius Franklin
ATMOSPHERIC CORROSION OF COPPER AND SOME COPPER ALLOYS. Can. Met. Quart., 9(1):339-348, March 1970. 6 refs.

Two-year atmospheric corrosion tests in an urban environment were conducted on specimens of copper, Muntz metal, and copper-zinc-aluminia alloys. The films on the top surface and underside of the exposure coupons were studied by X-ray diffraction and X-ray spectrography. Differences between the two surfaces are attributed to the leaching action of rain and the possible effect of direct sunlight. The corrosion products of copper consisted mainly of Cu2O, and also included a substance of undetermined composition, copper chloride, and basic copper chloride. The zinc-containing alloys formed similar products, along with zinc sulfates, and showed considerable dezincification. A pre-oxidation treatment of the copper-zinc-aluminum alloy gave a small increase in corrosion resistance, particularly on the underside of the coupon. The addition of aluminum to a copper-zinc alloy does not change the corrosion products, but does reduce the corrosion rate and the amount of dezincification which occurs. (Author abstract modified)

8364 APTIC NUMBER 19162

Pope, D., M. H. Gibbens, and R. L. Moss
THE EFFECT OF VACUUM-DEPOSITED IRON ON THE SULPHIDING OF SILVER BY HYDROGEN SULPHIDE. Corrosion Sci., 7:673-681, 1967. 8 refs.

The rate of silver sulfide formation in 1% hydrogen sulfide increased with surface iron concentration to a maximum of 75 times the rate for undoped silver at approximately 150 ng Fe/sq cm, then decreased sharply to a low level at higher iron concentrations. This can be demonstrated experimentally by counting sulfide spots on photomicrographs. The presence of iron is thought to catalyze the production of elemental sulfur, regarded as the slowest step in the reaction chain by which silver sulfide is formed. The silver sites which can actively incorporate sulfur, when iron is present to dissociate the hydrogen sulfide, hold the iron as small crystallites. As the amount of iron deposited is increased, these crystallites grow until they reach a size sufficiently large to block off the active sulfiding sites. After the sharp fall in the rate at 150 ng/sq cm of Fe, the iron is still actively dissociating H2S but sulfur can only be incorporated at silver sites of low activity.

8365 APTIC NUMBER 19169

Salsom, Richard L.
SYSTEMS ANALYSIS OF THE EFFECTS OF AIR POLLUTION ON MATERIALS. (FINAL REPORT). Midwest Research Inst., Kansas City, Mo., NAPCA Contract CPA-22-69-113, Proj. 3323-D, 187p., Jan. 1970. 352 refs.

To determine the economic effects of air pollution on materials, topics reviewed are: approach to economic effects determination; intensity of air pollution; physical/chemical effects of air pollutants on materials; economic value of materials exposed to air pollution; interactions between pollutants and materials; significance of pollutant-material combinations; identification of information gaps. Estimated economic losses due to air pollution are set at $:00 billion from soiling and $4 billion from deterioration. A three-phase research program is recommended as follows: improvement of techniques for quantifying the economic effects of air pollution on materials; development of physical and chemical data on air pollution effects; and continuation and refinement of the economic evaluation of these effects.

8366 APTIC NUMBER 19353

Schaffer, R. J.
ATMOSPHERIC POLLUTION IN ITS BEARING ON THE WEATHERING OF STONE AND SIMILAR BUILDING MATERIALS. In: Investigation on Atmospheric Pollution. Dept. of Scientific and Industrial Research, Cambridge (England), Rept. 28, p. 111-121. 1960 (?).

Atmospheric pollution affects building materials in two ways: soot adheres to the surfaces, causing discoloration and disfigurement, while sulfur dioxide and ammonium sulfate bring about chemical changes. Except with magnesian limestone, the appearance of efflorescent salts on the surface of the stone indicates that the decay is to be attributed to some cause other than, or in addition to, atmospheric pollution, but the reverse statement does not apply. Buildings in towns are more disfigured by soot than those in country districts, and there are marked differences in behavior between different materials. With sandstones of good quality, surface erosion does not occur and washing by rain is not effective in preventing soot deposition, while the degree of discoloration of limestones by soot varies with the aspect and degree of exposure. The only mineral constituents of building stones that are significantly affected by the acids in the air and rain water are the carbonates of lime and magnesia. Suitable choice and use of materials is the first safeguard against decay but is of little avail against discoloration by soot; those building stones that suffer most seriously in this respect are among the most durable. Oil paint, applied when the stone is dry and renewed every few years, has good protective qualities; limestone buildings can be hosed down with water at intervals; and the inhibition of skin-formation and the removal of decomposition products should also enhance durability.

8367 APTIC NUMBER 21943

Spedding, D. J. and R. P. Rowlands
SORPTION OF SULPHUR DIOXIDE BY INDOOR SURFACES. I. WALLPAPERS. J. Appl. Chem. (London), vol. 20:143-146, May 1970. 9 refs.

The sulfur dioxide sorption characteristics of polyvinyl (PVC) wall coverings and conventional wallpaper samples at low SO2 concentrations (maximum 100-125 micrograms/cu m) were studied with the aid of SO2(35). Surface S(35) was measured with a soft beta monitor, while the distribution of S(35) on the wallpaper

samples was determined by autoradiography. The PVC wall coverings showed a SO2 uptake of less than 0.002 micrograms/sq cm, the conventional wallpapers an uptake of about 0.005 micrograms/sq cm. Within each category of wall covering, sorption was found to be influenced by surface finish, the pigments used to make up the design of the wallpaper, and the design pattern. For example, unlacquered PVC coatings sorbed more SO2 than lacquered PVC coatings, and embossed wallpapers sorbed more SO2 on the raised areas of the emboss than in the depressions. Irregular areas of high SO2 uptake were associated with sweat deposits left from handling samples. The effect was most obvious with the PVC coverings. The results of soaking wallpaper samples in dilute aqueous sodium sulfate solution indicate that the sulfur from SO2 was present on the wallpapers either in a water-soluble form, or in a form that was exchangeable with the large excess of sulfate in the solution, or both.

8368 APTIC NUMBER 19249

Suzuki, Ichiro, Noboru Masuko, and Yoshihiro Hisamatsu
STUDY OF THE RUST LAYER ON ATMOSPHERE CORROSION RESISTANT LOW ALLOY STEELS (PART 3) PORE-SIZE DISTRIBUTION OF RUSTS. (Taikoko no sabiso nikansuru kenkyo (dai 3 po). Grandotetsu sabiso oyobi jinko sabi no saiko bunpu). Text in Japanese. Boshokugijutsu (Corrosion Eng.), 19(2):79-88, Feb. 1970. 4 refs.

Nitrogen adsorption isotherms of artificial and natural rusts were measured beyond the relative pressure of 0.98, and the results were used to obtain such characteristic values as pore-size distribution, specific surface area, total pore volume, and average pore diameter. The artificial rusts were prepared by an interfacial reaction between sodium hydroxide solution and ferric-ferrous salt solution with or without the addition of cupric salt. Natural rusts were obtained from iron-copper alloys containing 0, 0.24, 0.44, 0.60, 1.02 and 2.0% Cu after exposure to an urban atmosphere for 16 months. Pore-size distribution of the natural rusts ranged to 100 A, but the majority of pores were always below 50 A. Pore-size distribution in the artificial rusts was similar but the total pore volume was about 10 times higher than that of the natural rusts. Total pore volume and specific surface area tended to increase and the average pore diameter to decrease as the copper content of rust increased. Small amounts of copper are shown to inhibit the growth of colloidal particles which constitute the texture of the rust. (Author abstract modified)

8369 APTIC NUMBER 21889

Tokoroki, Hiichi and Satoshi Kado
ON THE RUST LAYER OF LOW-ALLOY STEEL. (Taikoseiko no seiso ni tsuite). Text in Japanese. Nippon Kinzoku Gakkaishi (J. Japan Inst. Metals), 33(7):806-810, 1969. 13 refs.

Although it has been known that the long-term exposure of atmospheric corrosion resistant low-alloy steel to the atmosphere produces compact and adhesive rust layers of protective quality, they have not been investigated as much as in the case of carbon steel. Thus, the rust layers of the two types of steel were analyzed by means of exposure to semi-rural atmosphere for three years and six years. The square analysis of the rust layers by X-ray microanalyzer demonstrated the concentration of chromium, copper, phosphorus, and sulfur, and little concentration of nickel in the rust layer of low-alloy steel. Sulfur was more concentrated in the rust layer of low-alloy steel than in that of carbon steel. Chemical analysis showed that the sulfur content in the inner rust layer of low-alloy steel as compared to the substrate metal is twenty times higher, and it is clear that the concentration of sulfur results from the reaction with SO2 in the atmosphere. From X-ray diffraction of the rust layers, alpha-FeOOH, gamma-FeOOH, and Fe3O4 were observed in both types of steel; in terms of crystalline elements, the two types of steel show no difference. The above results show that the difference in the distribution of sulfur in the rust layers of the two types of steel is notable, and instead of searching for the characteristics of low-alloy steel in its rust layer, it is necessary to focus attention on the anodic reaction leading to the formation of ferrous sulfate at the rust layer/substrate metal interface.

8370 APTIC NUMBER 19712

Vannerberg, Nils-Gosta and Tomas Sydberger
AN ISOTOPIC TRACER METHOD FOR STUDYING THE MODE OF REACTION OF SULPHUR DIOXIDE ON METAL SURFACES. Acta Chem. Scand., 24(3): 1084-1085, 1970. 1 ref.

An apparatus was designed to study the corrosion initiation of relatively low concentrations (0.1-1.0 ppm) of sulfur dioxide at room temperature. It comprises a mixing chamber and an oxidation chamber in which the samples are exposed to the sulfur dioxide containing atmosphere and in which the soluble corrosion products are subsequently dissolved. In order to be able to analyze the corrosion products quantitatively, a (35)S-labelled sulfur dioxide was used. It was transferred to a steel tube under vacuum and mixed with argon to a pressure of 15 atm. A measured volume of the gas mixture was bubbled through a 1% hydrogen peroxide solution which was titrated with a barium chloride solution using a thorine indicator. Flow rates were measured to 1 l/hr for air and 0.01 l/hr for the SO2-Ar mixture. The stream of air was allowed to pass through a system of water-containing flasks in order to saturate it with water vapor. Iron samples of high purity were exposed to the sulfur dioxide atmosphere, and the oxidation chamber was filled with 0.1 M hydrochloric acid after 5-20 hr. The soluble corrosion products were dissolved while a stream of argon was passed through the solution, which was then transferred to a flask where remaining SO2 and possibly even hydrogen sulfide were removed by boiling. Samples were taken from the solution and the sulfate was precipitated with barium chloride. The precipitate was analyzed with a Geiger-counter, indicating a high percentage of sulfate in the corrosion products. Reproducibility is rather low, probably due to insufficient control of humidity and sulfur dioxide concentration.

ECONOMIC ASPECTS

8371 APTIC NUMBER 19399

Barrett, Larry B. and Thomas F. Waddell
THE COST OF AIR POLLUTION DAMAGES: A STATUS REPORT. Public Health Service, Raleigh, N. C., National Air Pollution Control Administration, 94p., July 1970. 70 refs.

Efforts in estimating the cost of air pollution damages are reviewed. National total annual costs of air pollution are developed. The costs for effects on health, vegetation, materials, residential property value, and soiling have been determined. Costs have not been studied for effects on animals and aesthetics. National total annual costs for 1968 are $16.1 billion. This includes $5.2 billion for residential property, $4.7 billion for materials, $6.1 billion for health, and $0.1 billion for vegetation. The cost for each effect is distributed among the several pollutants considered responsible for that effect according to their relative emissions. The same cost is distributed among the sources by their relative emissions. No cost function relations could be developed for various levels of pollution. As a consequence, the pivotal functions of marginal benefit are precluded. The $16.1 billion figure is a reasonable, conservative estimate. The subject of the cost of pollution would benefit from further effort in all aspects. (Author summary modified)

8372 APTIC NUMBER 11857

Boubel, Richard W.
A MODIFIED STATISTICAL 'TRANSPORTATION PROBLEM' AS APPLIED TO AN ATMOSPHERIC WASTE DISPOSAL EVALUATION. Preprint, Air Pollution Control Association, New York City, 10p., 1965. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 58th, Toronto, Canada, June 20-24, 1965, Paper 65-161.)

In Oregon, residue from lumber and plywood manufacturing is usually incinerated in tepee burners. Since the particulate emission for a typical burner is about 30 pounds of aerosols per ton of fuels consumed, the burners present serious air pollution problems, particularly for Bear Valley where radiation inversions are common, resulting in a stable air condition with poor pollution dispersal. A preliminary cost study was made of the feasibility of alternate means of residue disposal in the valley, either using multiple chamber incineration facilities or power generation. The analysis, which used a constant cost figure for transportation of the residue from mill sites to disposal facilities, indicated that the cost of either method would be prohibitive. Transportation was a large item in the cost analysis. To reduce transportation costs, it will be necessary to optimize the number and location of disposal facilities. Related to the transportation problem was the location problem, i.e., distributing a combination of facilities throughout an area to minimize the costs of construction and expenses incurred in transporting resources to these facilities from predetermined source points. If burners were eliminated by authorities, the successful solution of this problem would enable mill owners to minimize disposal costs.

8373 APTIC NUMBER 19071

Bunyard, F. L.
POLLUTION CONTROL FOR THE KRAFT PULPING INDUSTRY: COST AND IMPACT. Preprint, Air Pollution Control Association, New York City, 25p., 1970. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., 1970.)

The Clean Air Act, as amended, requires comprehensive studies of the economic impact of air quality standards on the nation's industries and other contributing sources of pollution. Such information is needed to estimate the cost of compliance that may be required to meet ambient air quality or emission standards. An economic appraisal of the pulping industry's efforts to meet these standards is presented. Expenditures by the industry for control equipment for a recent year are given. Types of equipment employed to control sulfur dioxide, hydrogen sulfide, and particulates include scrubbers, packed towers, precipitators, catalytic oxidation units, and power boiler mechanical collectors. An analysis predicting control costs for building new, modern mills and for upgrading existing mills to comply with Oregon's 1975, particulate and total reduced sulfur emission standards for the kraft recovery process shows that the cost of this level of control will be about $0.16 per ton in new mills and about $2.00 per ton for existing mills. The thrust of the Oregon standards, as shown by the impact analysis, will be directed toward controlling emissions from the direct-contact evaporator and black liquor combustion furnace system. The financial requirements for air pollution control to comply with Oregon's emission standards are reviewed in terms of profitability and capital investments. For an individual 600 ton-per-day mill, investment for upgrading the facility would be approximately $2 million.

8374 APTIC NUMBER 19337

Crawford, P. B.
ESTIMATION OF STORAGE COST AND RATES OF EVAPORATION OF LIQUEFIED GAS (METHANE, ETHANE, ETHYLENE, AND PROPYLENE) IN UNDERGROUND ROCK CAVERNS. (Estimation du cout du stockage et du taux d'evaporation de gaz liquefies (methane, ethane, ethylene et propylene) dans des cavites rocheuses souterraines). Text in French. Rev. Inst. Franc. Petrole Ann. Combust. Liquides (Paris), 16(1):65-78, Jan. 1961. 12 refs.

The approximate costs and evaporation rates of storing liquefied methane, ethane, ethylene, or propylene at atmospheric pressure in underground rock caverns are presented. Methane liquefies at -285F at atmospheric pressure. A surface storage facility for liquid methane costs approximately $6.50 per thousand cu ft to construct. The costs of underground or mined cavern storage are approximately 75¢ to $1.75 per thousand cu ft, depending on cavern size and mining conditions. The evaporation rates at atmospheric pressure range from one percent to less than one-tenth of one percent per day, depending on cavern size, pressure, and other factors. The rates decrease as the rock is cooled. Storage at elevated pressures markedly reduces evaporation rates. Storage at 400 psig reduces the evaporation of liquefied methane by 35%, ethane by 85%, and ethylene by 70%. Insulation of the cavern wall will reduce the evaporation

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rate even more. In cases where liquid methane is supplied to tankers, vaporization and expansion of the liquid through turbines could produce power equivalent to approximately 50,000 kw hr/billion cu ft of gas evaporated/day. The refrigeration available below 32 F will be approximately 50,000 tons/day. (Author abstract modified)

8375 APTIC NUMBER 19141

Crocker, Thomas D.
THE MEASUREMENT OF ECONOMIC LOSSES FROM UNCOMPENSATED EXTERNALITIES. Virginia Polytechnic Inst., Blacksburg, Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p. 180-194. 2 refs.

In an imperfect market economy, a collective agency will have to infer relative valuations of users for natural resources from something other than directly observable market prices. The control agency can try to gauge political expressions, representations, and exhortations in the hope that their interests somehow correspond to intensity of preference for one outcome over another. Another approach to infer the relative valuation of a resource is to observe the price of the goods that contribute to its value and/or to which it contributes value. Three groups of alternative means of measuring air pollution damage are: (1) the direct use of technical coefficients of production and consumption; (2) the rise of property values; and (3) the use of interviews with air pollution sufferers. A summary of two attempts to measure air pollution damage by means of land values is presented. The omissions of these two attempts and a framework to correct these omissions are discussed.

8376 APTIC NUMBER 19142

Davis, Otto A. and Morton I. Kamien
EXTERNALITIES AND THE QUALITY OF AIR AND WATER. Virginia Polytechnic Inst., Blacksburg, Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p.12-21.

The costs and benefits associated with any desired level of air and water quality are explained in the context of modern economical concepts. These concepts are considered in terms of real or opportunity costs and the divergence between real costs to society and real costs to individual economic entities. A criterion called Pareto Optimality, which asserts that an allocation of resources is optimal if no reallocation could make some members of society better off without making others worse off, is discussed. The best way of attaining any prespecified level of water and atmospheric quality levels using the Pareto Optimality criterion is described. The presence of technological and pecuniary externalities and how they can affect Pareto Optimality are discussed. The existence of a technological externality--the fact that those causing the pollution do not bear the full costs of their actions--can cause the market mechanism to depart from a Pareto Optimal situation.

8377 APTIC NUMBER 21651

Edmisten, Norman G.
AIR POLLUTION CONTROL COST STUDIES. In: Economics of Air and Water Pollution. William R. Walker (ed.), Blacksburg, Virginia Polytechnic Institute, Water Resources Research Center, 1969, p. 230-243. 3 refs.

To define and quantify the cost variations for air pollutant emissions that exist from one industrial segment to another, several source studies were conducted. The areas studied include: gray iron foundries, steam electric power generation, asphalt batching, integrated iron and steel, pulp and paper, cement manufacturing aluminum ore reduction, sulfuric acid manufacturing, and petroleum refining. Pollutant sources and the types and quantities of pollutants emitted are defined as well as specific problems that must be considered in basic equipment design and operation. Estimated costs for control equipment range from $0.45/acfm for centrifugal collectors to $3.00/ acfm for an electrostatic precipitator. The national expenditure for reducing air pollutant emissions in 1968 was approximately $300 million, while the average home owner pays an estimated 60 cents per year for particulate control. Additional expenses will result as the efforts to reduce sulfur oxides and other gaseous emissions are expanded.

8378 APTIC NUMBER 19278

Edmisten, Norman G. and Francis L. Bunyard
A SYSTEMATIC PROCEDURE FOR DETERMINING THE COST OF CONTROLLING PARTICULATE EMISSIONS FROM INDUSTRIAL SOURCES. J. Air Pollution Control Assoc., 20(7):446-452, July 1970. 4 refs.

This paper presents basic collection equipment costs and estimation factors for assessing the total cost of pollution control. In addition, a procedure is outlined for calculating the capital investment and annual cost of collection devices for particulate matter from industrial sources. The equipment considered includes dry centrifugal collectors, wet collectors, electrostatic precipitators, fabric filters, and afterburners. Purchase costs of the devices are illustrated by cost curves. By enabling the implementers of air quality-oriented control programs to consider air pollution problems from an economic, as well as a technical viewpoint, the information presented should result in more effective control decisions.

8379 APTIC NUMBER 19123

Evans, Basil M.
DESIGN AND CONSTRUCTION OF UNDERGROUND STORAGE UNITS. Gas Times, vol. 97:15-17, Dec. 1963. 1 ref.

The design and construction of underground units for storing liquid fuels are essentially functions of civil engineering, and the basic requirements are the soil or rock strength, the relationship between the vertical and horizontal pressures acting

at depth in a soil or rock mass, together with the compressibility, permeability, and porosity of soils and rocks. This information is used to determine the design of tunnel linings, effects of freezing on soils and rocks, allowable pressure in tunnels, and the design of circular below-ground tanks constructed of various materials. The principle costs associated with underground storage are those of the units themselves. As indicated by a chart of the comparative costs of different types of units, costs are lowest for salt cavities and highest for hand-excavated tunnels in clay and water-bearing rocks. For the storage of liquefied petroleum gas under pressure, construction costs will vary from about 15 to 123 dollars per ton. In the case of low-temperature storage of lpg, costs will vary from about 36 to 60 dollars a ton, depending on geological conditions.

8380 APTIC NUMBER 19294

Hashimoto, Michio
SOME IMPRESSIONS OF THE INTERNATIONAL SOCIAL SCIENCE SYMPOSIUM ON 'ENVIRONMENTAL DISRUPTION.' (Kogaimondai kokusaisinpojumu ni sanka shite - kankyo hatan o meguru ronten o chushintoshite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):433-438, June 15, 1970.

The term 'environmental disruption' is considered representative of the modern world where noxious contaminants resulting from productive activities challenge efforts to control their diverse effects on the environment. The recent symposium on environmental disruption failed to develop loss caused by the disturbance, nor did it discuss at any length emission standards for restricting pollutant concentrations to levels which would preserve the balance of nature. In addition, new types of environmental contamination by transportation or by future changes in living styles were not sufficiently explored. Forecasting and planning for environmental disruption, which were significantly elaborated by two participants, are considered to need further study because of their importance for control and because they involve the issue of the distribution of control costs. The consumer will likely pay more for goods produced by a manufacturer charged with responsibility for controlling pollutants. In this context, it is suggested that the 'social cost for public health', a term used by one speaker) may bridge the gap between security and ambient security.

8381 APTIC NUMBER 17317

Japan Economic Problems Council, Subcommittee for Public Nuisance
NATIONAL ECONOMY AND PUBLIC NUISANCE PROBLEM. (Kokumin keizai to kogai mondai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(1):53-60, Jan. 15, 1970.

Pollution is viewed in terms of national interest and economic structure and of the effect of control measures on the environment. In Japan, only a few years have passed since both quantitative and qualitative effects of pollution were revealed. Only recently have control measures been undertaken with the realization that pollution significantly affects the national economy. The severity of the pollution problem does not permit any delay and even reflects adversely on the progress Japan has made in industrialization. Economic growth must be balanced by improvements in the living environment. Control policies must be formulated in advance of changes to the living environment, since construction of industrial areas, urbanization, and the establishment of mass transport systems are followed by drastic environmental changes. A composite system of pollution control must be integrated with the over-all industrial structure if national economic development is to be well balanced.

8382 APTIC NUMBER 19398

Katell, Sidney and K. D. Plants
HERE'S WHAT SO2 REMOVAL COSTS. Hydrocarbon Process., 46(7): 161-164, July 1967. 7 refs.

An economic evaluation of three sulfur dioxide control processes is given: the Reinluft activated char, the alkalized alumina, and the catalytic oxidation processes. A summary of both the estimated capital requirements and operating costs is included. The operating costs exclude by product credit. The alkalized alumina process requires both the lowest capital cost and lowest operating cost. Several Japanese processes, one of which produces ammonium sulfate as a by product, are discussed. Phosphate rock and dolomite are being investigated for absorption processes.

8383 APTIC NUMBER 21666

Kirk, Michael M.
COST OF MIST ELIMINATORS. Chem. Eng., vol. 73:240, Oct. 10, 1966.

Cost curves are presented for mist eliminators of carbon and stainless steel. In the chart, demisting area is plotted against the cost of the total area. Installation is not included; this would average 0.3 to 0.4 of a manhour per sq ft of area. All costs are for the second quarter of 1966.

8384 APTIC NUMBER 19545

Kronseder, J. G.
ECONOMICS OF PHOSPHORIC ACID PROCESSES. Chem. Eng. Progr., 64(9):97-102, Sept. 1968.

A cost comparison is made of the five processes now in use for the production of phosphoric acid, using the dihydrate or common wet phosphoric acid process as a standard. The evaluation is based on consideration of payout (fixed capital divided by net profit after tax plus depreciation) for a new plant of large (600 tons/day) capacity. The differences in capital costs for other than the semihydrate gypsum process are not great. At the high operating recoveries of modern dihydrate plants, increase in recovery of new processes cannot compensate for the increased operating and capital costs unless the raw material costs are much greater

than those used in the analysis. Only the semihydrate gypsum process offers any opportunity for significant improvements in production costs and investment capital as compared with the dihydrate process. For these reasons it is concluded that the overwhelming bulk of phosphoric acid for high water soluble phosphate fertilizers will continue to be made by the dihydrate process. Flow diagrams are presented for the dihydrate and anhydrite processes, including filter feed tanks and scrubbers.

8385

APTIC NUMBER 21968

Linsky, Benjamin
CASE STUDIES OF COSTS (QUALITY AIR--LUXURY OR INEXPENSIVE NECESSITY). Virginia Polytechnic Inst., Blacksburg, Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p. 195-208.

A series of case studies relating pollution control costs, equipment, and effects are discussed. A breakdown of the consumers dollar in terms of what air and water pollution actually cost him is included. A system of concepts and phrases used in considering air pollution is presented. Proposals, reports, and local ordinances relevent to the discussion are included. Estimated costs for air pollution control for the gray iron foundry cupola (afterburners, scrubbers, baghouses, and electrostatic precipitators), steel plant (scrubbers, baghouses, and electrostatic precipitators), and chemical drying operation (primary cyclone, secondary multiple cyclones, secondary wet scrubbers, and baghouses) are subdivided into the following breakdown: air pollution emissions (particulates and droplets, gases); collection efficiency or recovery; and cost (capital investment, operating costs, and plant investment).

8386

APTIC NUMBER 19140

North, Ronald M.
MARKET MODIFICATIONS AND THE GOVERNMENT GRANTS ECONOMY. Virginia Polytechnic Inst., Blacksburg Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p. 76-91. 10 refs.

Federal-city cooperation is an important aspect of pollution control efforts. Grants-in-aid from the federal government to cities, states, and other local governments are quite common. Grants-in-aid are discussed in terms of a new phenomenon called the grants economy. This economy is not necessarily private market or price oriented. Grants-in-aid are defined as payments in either cash or transfers in kind (things and services) to help a state or local government administer federal policies, programs, services, or activities. Although the grant may be conditional, the recipient ordinarily is not required to repay it. The effects of a grants-in-aid economy upon the market economy are discussed. The current state of the federal grants-in-aid program is reviewed.

8387

APTIC NUMBER 19455

Resnick, Irving
LIQUEFACTION FOR STORAGE OF NATURAL GAS SHOWS PLANT INVESTMENT ECONOMY. Am. Gas J., vol. 171:23-24, Aug. 1949.

Liquefaction of natural gas permits storage of large volumes of the gas at lower investment costs than is possible by any other means. Both the expander cycle and the cascade refrigeration cycle are thermodynamically efficient liquefaction processes, but the horsepower requirements for the latter are less than those for the former. Minimum power is required by the ammonia-ethylene cascade cycle. While the economics of such a plant depend on the size of the storage, liquefaction, and refrigeration units, the plant is always an economical investment if the units return to the system two, three, or four times as much gas as the storage facilities can hold. Because the storage plant represents the major portion of overall plant cost, it is desirable to maintain the storage plant small and reliquefy as frequently as possible between peak days in winter. Costs of natural gas as a liquid are approximately $7.00/Mcf in plant investment or two dollars more than for propane equipment. However, once a plant has been installed, peak gas loads can be supplied at a much lower cost than from propane-air gas or oil-gas facilities.

8388

APTIC NUMBER 19685

Scollon, T. Reed
IMPACT OF AIR POLLUTION REGULATIONS ON COAL. Mining Eng., 22(8):67-69, Aug. 1970.

During the past few years the increase in total demand for U. S. bituminous coal has resulted essentially from an increase in demand by electric utilities, which in 1967 amounted to about 50% of all coal shipped to U. S. markets. It is estimated that only about 60 million tons of the utility total was low-sulfur coal, most of which is and will be used for making coke. Between 1967 and 1980 the total demand for U. S. coal should increase by about 150-250 million tons, most of the increased demand coming from the electric utilities. The wide range in the projected increase results from uncertainties in developments in nuclear power and in air pollution regulations and control technology. If control regulations are adopted and enforced on a widespread basis over a short-term period, and if substitute fuels become available, markets for coal could be reduced by more than one-half. Because of the higher mine prices for low-sulfur coals and the greater distances between large industrial coal-consuming areas and sources of low-sulfur coal, the delivered prices of available low-sulfur coals would be much higher than those for high-sulfur coals. If the rate of adoption of regulations were such as to permit the development and installation of sulfur-oxide removal processes, the loss of coal markets would be less severe. Under such circumstances, coal losses would be limited to small industrial plants that are unable to afford removal systems.

8389 APTIC NUMBER 21962

Tullock, Gordon

CONTROL-LAWS AND REGULATIONS-PROPERTY RIGHTS. Virginia Polytechnic Inst., Blacksburg, Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p. 92-104. 1 ref.

A discussion of the economic externalities of the pollution situation is presented. An externality occurs when some individual's action affects the utility of others. An example would be the smoke from an industrial stack falling on a neighbor's clean wash. Designing optimal property laws and appropriate restrictions on those externalities which cannot be taken care of in the property law is a difficult task. A description of how the law can help property owners in this type of situation is given.

8390 APTIC NUMBER 21749

Weidensaul, T. Craig and Norman L. LaCasse
STATEWIDE SURVEY OF AIR POLLUTION DAMAGE TO VEGETATION - 1969. Pennsylvania State Univ., University Park, Center for Air Environment Studies, PHS Grant AP 00002, 1970, 52p. 3 refs.

During the summer of 1969, a statewide survey of air pollution damage to vegetation was conducted to assess economic losses incurred on food and fiber crops in Pennsylvania. Most incidents occurred in areas of greatest agricultural activity. The greatest economic losses were observed on vegetable, fruit, and agronomic crops, followed by lawns, ornamentals, greenhouse flowers, and forest trees. The suspected major pollutants, based on associated economic losses, appear to be as follows: oxidants, sulfur oxides, lead, hydrogen chloride, particulates, herbicides, and ethylene. The total amount of direct economic loss was estimated to be more than 3.5 million dollars. Indirect losses accounted for an additional 8 million dollars. These losses include known profit losses to growers, costs of reforestation of denuded land, known greater relocation costs, and substitution of lower value crops for higher value ones. Other indirect effects are stream silting, erosion, farm abandonment, and loss in aesthetic values. (Author abstract modified)

8391 APTIC NUMBER 21896

American Society of Mechanical Engineers, New York, Air Pollution Standards Committee
ASME STANDARD APS-2. RECOMMENDED GUIDE FOR THE CONTROL OF EMISSION OF OXIDES OF SULFUR. COMBUSTION FOR INDIRECT HEAT EXCHANGERS. 11p., Jan. 1970. 14 refs.

The three basic methods for controlling pollution of the air by waste materials are reduction in production of pollutants, collection of pollutants, and dispersion of the pollutants in ambient air by air motion. Control usually involves a combination of two or more of these. The philosophy was adopted that the maximum concentration of sulfur dioxide in the ambient air resulting from discharges is of primary importance when regulating ambient air quality. A method is presented for estimating the concentration of SO2 in ambient air based on the stack height, total heat input, and sulfur content of the effluent. An alternate method involving the allocation of emissions among several stacks of equal height is included. The limitations of these systems caused by the presence of large numbers of low level SO2 sources and topographical conditions are considered. Data presented are arbitrarily cut off at 10,000 million Btu/hr on the theory that very large sources will have to take additional factors into account. Abatement is, of necessity, concentrated on effluent control, since the desulfurization of solid fuels has limited potential and desulfurization of liquid fuels requires extensive and costly additions to existing installations. Flue gas desulfurization techniques under development are limited to large installations because of cost and space and may themselves introduce serious problems of disposal of low strength sulfuric acid and/or large quantities of dust.

8392 APTIC NUMBER 20079

FUTURE U. S. AIR POLLUTION REGULATIONS. Automobile Eng. (London), 1970:145-148, April 1970. 5 refs.

If the number of cars in use increases at the expected rate, and no further controls are introduced, the minimum level of air pollution in the U. S. will be reached by about 1985. After 1985, the amount of pollutants in the atmosphere will increase again. Moreover, the 1985 pollution levels will significantly exceed those of 1940. Although stationary sources will discharge the larger proportion of nitrous oxides, motor vehicles will still be the major source of carbon monoxide and unburnt hydrocarbons. To meet regulations more stringent than those of 1972, it appears likely that cars will need both exhaust reactors and air injection pumps. Unfortunately, the widespread use of exhaust reactors could lead to severe problems with vapor locks and impair power outputs and fuel consumption. It is possible, therefore, that other types of power units may once again become competitive, in particular the gas turbine and the Wankel engine. Exhaust emission data are presented for these engines and for engines with exhaust reactors and air injection systems, together with California and intended U. S. Federal regulations.

8393 APTIC NUMBER 20194

Chzhen-tsi, Chzahao
BASIC EXPERIMENTAL INFORMATION FOR THE DETERMINATION OF THE LIMIT OF ALLOWABLE METHANOL CONCENTRATION IN ATMOSPHERIC AIR. In: Limits of Allowable Concentrations of Atmospheric Pollutants. V. A. Ryazanov (ed.), Book 5, Washington D. C., U. S. Public Health Service, March 1962, p. 67-78. 18 refs. (Translated by B. S. Levine.)

Studies were conducted of the presence and effects on rats and humans of methanol as an atmospheric pollutant. Methanol vapor concentration was determined by a method based on methanol oxidation to formaldehyde by means of potassium permangante in phosphoric acid medium. It was found that 4.3 mg/cu m of methanol vapor in atmospheric air constituted the odor perception threshold concentration for sensitive persons; 3.7 was the subthreshold concentration. The threshold methanol vapor concentration affecting eye sensitivity to light was 3.3 mg/cu m. Concentrations below odor perception threshold affected the functional state of the cerebral cortex. Exposure to 50 mg/cu m concentration 12 hr daily for 3 months brought about changes in motor chronaxy and in the ratio of flexor and extensor chronaxies. Equalization (chronaxy ratios equallized) and at times reverse chronaxy ratios occurred most frequently as a result of exposure to higher concentrations. Inhalation of 1.77 mg/cu m produced no such results. Using threshold of reflex effect on eye sensitivity to light as an index, together with the need for a safety coefficient, 1/5 mg/cu m is recommended as the MAC value for atmospheric methanol vapor. Methanol-emitting pharmaceutical and chemical plants should not be located near residential areas, and should be equipped with adequate control equipment. (Author conclusions modified)

8394 APTIC NUMBER 19468

Farmer, Jack R., Philip J. Bierbaum, and Joseph A. Tikvart
PROCEEDING FROM AIR QUALITY STANDARDS TO EMISSION STANDARDS. Preprint, Air Pollution Control Association, New York City, 83p., 1970. 26 refs. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-19, 1970, Paper 70-85.)

Techniques employed for formulating various emission control strategies for sulfur oxides and particulate matter and for evaluating each strategy in order to select the one most appropriate are reported. The most important objective of the Clean Air Act is to insure that air pollution problems will, in the future, be controlled in a systematic way. The primary mechanism for achieving this consists of proceeding from air quality standards to an implementation plan that restricts the emission of air pollutants. The heart of an implementation plan is its emission control regulations which establish requirements and a timetable for their attainment. Control regulations are emission control strategies that incorporate the legal terminology necessary to make them legally enforceable. An emission control strategy is composed of the various emission standards selected for the different categories of sources. For example, an emission control strategy for particulates would include emission standards

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for combustion sources, industrial process sources, and solid waste disposal sources. One reasonably accurate quantitative procedure for assessing the impact of alternative control strategies on air quality is simulation modeling. These simulations, however, do not explicitly include the effects of meteorology and topology and can only be applied where observed air quality data are available. A more exact relationship can be found by mathematically simulating the effect of atmospheric elements, such as air flow and mixing, on the transport and dispersion of pollutants emitted to the atmosphere. Such a dispersion model is useful for calculating at any point the pollutant concentrations that result from various sources and categories of sources. By using the dispersion model and a statistical formulation, it is possible to obtain an annual average concentration plus some estimate of the short-term maximum concentration that can be expected to occur. The air quality standards adopted for a given region must not only be achievable under existing well controlled emission levels, but in the future, as well, when pollution levels will change as a result of growing urbanization and industrialization. Finally, since several control strategies may exist that are capable of meeting the air quality standards and each strategy will have different advantages and disadvantages, a number of different strategies should be evaluated so that the most reasonable and desirable one may be selected.

8395 APTIC NUMBER 21780

Japan Association of Industrial Hygiene, Tokyo
RECOMMENDATION OF PERMISSIBLE DENSITIES. (Kyoyo nodo nado no kankoku). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 12(4):48-54, May 20, 1970.

Recommended allowable concentrations are presented for matter in working environments. Permissible density is defined as that which does not exert a harmful influence on most workers if the concentration of noxious matter in the air is lower than this. It is noted that some workers can be expected to be adversely effected by densities even lower than those recommended. Allowable standards for constant noise, necessary to protect hearing, are included, as well as standards for temperatures, conducive to efficient work. Also presented is a method of measuring powdery dust.

8396 APTIC NUMBER 21763

Jensen, D. A.
POLLUTION CONTROL LIMITS OF THE INTERNAL COMBUSTION ENGINE. Ford Motor Co., Dearborn, Mich., 7p., 1967. (Presented before the Panel on Electrically Powered Vehicles, Washington, D. C., Feb. 17, 1967.)

After qualifying the conclusions presented by a lack of certainty as to just what the pollution problem is and what regulation is necessary, ultimate achievable limits are listed as 40 ppm hydrocarbon emission, 0.2% carbon monoxide emission, and 100 ppm nitrogen oxides emission. Less stringent requirements are listed as those necessary in the state of California in the year 2000.

8397 APTIC NUMBER 19808

Kobayakawa, Takashi
EXHAUST EMISSION CONTROLS OF U.S.A. AND EUROPE. (Obei ni okeru haikiqasu taisaku). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8(2):18-26, June 1970. 4 refs.

Smogs essentially fall into two different categories. London type smog has little to do with automobile exhausts and is the combination of household and industrial smoke plus fog. On the other hand, the smog characteristic of Los Angeles is mainly due to automobile emissions and is known as photochemical smog. The two types of smog are compared according to meteorological, seasonal, diurnal conditions, and their main sources. Various emission standards of the state of California are listed for carbon monoxide, hydrocarbons, nitrogen oxides, and smoke emissions, in addition to future control programs. Although smog in Japan and Europe falls into the London type, the significance of carbon monoxide is being recognized in large cities such as Paris and London. Nitrogen oxides are also demanding attention, but further research is yet to be conducted in Japan. Different emission standards for automobiles are listed and compared for the United States, Japan, and Economic Commonwealth of Europe. Another important component of air pollution from automobiles is particulates arising from the lead additives in gasoline. It has come to be recognized by the automobile manufacturers in the United States that the removal of lead additives would contribute to abatement with respect to the following points: the effectiveness of catalysts for removing carbon monoxide and hydrocarbons will be prolonged; manifold reactor life will be extended; the effectiveness of exhaust recycling system will be boosted; and other benefits such as avoiding the formation of lead salts will be gained. In connection with the above, several different types of exhaust treatment systems are introduced by means of block diagrams. Other methods of powering automobiles are considered, such as electric and steam engines, but they are still much underdeveloped. The present attempts by European countries to abate automobile exhaust pollution, especially the visible black smokes and obnoxious odors, are discussed.

8398 APTIC NUMBER 19818

LIST OF JAPANESE INDUSTRIAL STANDARDS ON AIR PURIFICATION AS OF MARCH 1970. (Kuki seijo ni kansuru JIS ichiranhyo. 1970 nen sangatsu genzai). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 8(2):62-64, June 1970.

Japanese industrial standards listed under special alphabetical, four-digit codes include the following: methods for continuous measurement of carbon monoxide, carbon dioxide, and hydrocarbons in automotive exhausts; analysis of ammonia, nitrogen oxide, fluorides, chlorine, hydrogen chloride, hydrogen sulfide, and hydrogen cyanide in flue gas; polarography; conductivity; potential difference titration methods; gas chromatography; light absorption; infrared spectroscopy; granular activated charcoal; powdered activated charcoal; cokes; industrial gasoline;

automotive gasoline; kerosine; light oils; heavy oils; airplane gasoline; jet fuels; liquefied petroleum gas; air filter oil metal corrosion experiment; quantitative analysis of lead anti-knock agent in gasoline; analysis of sulfur in petroleum products; kerosene stove; tests by Geiger-Muller counter; radiation survey meter; air filter for radioactive particulates, measurement of smoke and dust in flue gas; tests for airborne particulates (weight method by electrostatic dust-sample); and measurement of sterilizing ultraviolet light.

8399 APTIC NUMBER 19214

CALCULATION OF CHIMNEY HEIGHT FROM AIR POLLUTION CONTROL STANDPOINT. (Taikiosen boshiho niyoru entotsu takasa no keisan). Text in Japanese. Netsu Kanri (Heat Management: Engery and Pollution Control), 22(6):49-53, June 30, 1970.

The emission standard of dust and smoke in relation to chimney height dust and smoke is stipulated in Article 4 of the Japanese Air Pollution Prevention Act. The calculation of chimney height is to follow the procedure given in Article 3 of the Regulations for the enforcement of the Act. The dust and smoke include sulfur oxides, soot, and particulates. Normally, the emission of the soot and particulate is within the limits stipulated. The sulfur oxides, however, require close attention. An explanation is provided of the equation between sulfur oxides and chimney height, giving practical examples of calculation. The emission rate of sulfur oxides is proportional to the square of a modified chimney height. The proportional constant is determined for each city by the Act. The modified chimney height is the actual height of the chimney plus 0.65 times the sum of the height of the smoke by momentum and that of the smoke by buoyancy. Equations are given for calculating these heights from the exhaust rate, velocity, and temperature of the flue gas. The maximum concentration of SO2 on the ground is derived from the basic equation of emission. Since the height of the chimney is closely related to its construction cost, the determination of the emission rate of sulfur oxides is very important.

8400 APTIC NUMBER 19549

Novak, Josef and Vladimir Vasak
DISCUSSION OF THE INTERPRETATION OF THRESHOLD LIMIT VALUES. Am. Ind. Hyg. Assoc. J., 27(6):555-558, Nov.-Dec. 1966. 12 refs.

When air is analyzed for individual pollutants, the calculation of the threshold limit value (TLV) for the mixture is not difficult. In the calculation of TLV for mixtures, the assumption of ideal behavior can lead to results considerably apart from actual conditions. Better results can be obtained by taking into account the activities of the components of such mixtures. The departure from ideal behavior is greater, the more the intermolecular forces and the molecular sizes of individual components of the mixture differ. The difference between the activity and concentration of a particular component of a mixture reaches a maximum at maximum dilution. A particular component of a mixture can influence considerably the activity coefficients of the other components of the same mixture. The necessary equations and several examples of this type of calculation are included. (Author abstract modified)

8401 APTIC NUMBER 21863

Oshio, Toshiki
EMISSION STANDARD AND AMBIENT AIR QUALITY STANDARD FOR SULFUR OXIDES (I). (Iod sankabutsu no haishutsu kijun to kankyo kijun (I)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 5(4):273-284, 1969.

The concentration of sulfur in heavy oil from various districts was tabulated. The maximum allowable ground concentration, C sub max, was proposed as a guide in formulating the emission standard, and was given by the equation C sub max equals (D.C.Q)/H sub e) squared, where C is equivalent to the concentration of polluted material in smoke; Q is equivalent to the rate of smoke emitted; H sub e is equivalent to efficient height of the chimney; and K is equivalent to a constant. For comparison purposes with old standards, the following diffusion equations were discussed in detail: Bosanquet-Pearson's equation, Sutton's equation, and Pasquill's equation. The derivation of emission standards from these equations was discussed.

8402 APTIC NUMBER 19915

Popov, V. A.
HYGIENIC ASSESSMENT OF TETRAHYDROFURAN AS AN ATMOSPHERIC POLLUTION. (Gigienicheskaya otsenka tetragidrofurana kak zagriaznitelya atmosfernogo vazdukha). Text in Russian. Gigiena i Sanit., no. 5:16-19, 1970. 7 refs.

The maximum permissible concentration of tetrahydrofuran (THF) in the atmosphere is suggested to be 0.2 mg/cu m. The threshold of the smell of THF vapors and the bioelectric cerebral activity of man were used as the basis in determining this level. Sanitary toxicologic tests conducted on albino rats for three months made it possible to recommend this level as the daily average maximum permissible concentration. Field observations proved an experimental THF plant producing 100 tons a year to be an insignificant pollution source. However, a THF plant producing 400 tons a year causes air pollution with THF vapors as far as 75 miles away. (Author abstract modified)

8403 APTIC NUMBER 21684

Rijnmond Public Agency (Netherlands), Task Group on Standards for Air Pollution
PROVISIONAL REPORT OF THE MAXIMUM ADMISSIBLE POLLUTION OF THE OUTSIDE AIR WITH SO2 IN THE AREA OF RIJNMOND. 1969 (?). Translated from Dutch. Belov and Associates, Denver, Colo., 7p., April 15, 1970.

Recommendations are made for maximum emission concentrations (MIC values) for sulfur dioxide in the area of Rijnmond in The

Netherlands. The proposed MIC value for a 24-hr average is 500 micrograms/cu m; the annual average concentration should be below 150 micrograms/cu m. These values are based on epidemiological data from the international literature, and take into account acute, subacute, and chronic exposure situations. The known effects of various concentrations of SO2 on humans, animals, plants, and materials are briefly noted; the subacute effect on humans during 1-3 day exposures consists of exacerbation in the condition of persons already having some health impairment. SO2 may be primarily an indicator pollutant, with harmful effects arising from the presence of other substances, e.g., sulfuric acid. The proposed MIC values will be revised as new data become available.

8404 APTIC NUMBER 21918

Rumsey, Donald W. and Ramon P. Costa
ODOR THRESHOLD LEVELS FOR UDMH AND NO2. Am. Ind. Hyg. Assoc. J., 31(3):339-343, May-June 1970. 12 refs.

The odor threshold levels for unsymmetrical dimethylhydrazine (UDMH) and nitrogen dioxide have been generally quoted at 6 to 14 parts per million (ppm) for UDMH and 5 ppm for NO2. The value for UDMH is twelve to twenty-eight times the threshold limit value. Seven years of field experience by personnel of this section have indicated that the actual odor thresholds are considerably below these values. Since odor threshold levels are used by safety and operating personnel at Cape Kennedy as an indication of exposure, it was considered appropriate to evaluate this field experience. On the basis of these data and the results of some controlled studies, it was concluded that the actual odor thresholds are 0.5 ppm or less for NO2 and less than 0.3 ppm for UDMH. (Author abstract modified)

8405 APTIC NUMBER 21840

Stratmann, Heinrich
THE APPLICATION OF ATP ANALYSIS TO THE EVALUATION OF THE EFFECT OF SULPHUR DIOXIDE UPON VEGETATION. (Die Anwendung der Luftanalyse zur Beurteilung von Schwefeldioxyd-Einwirkungen auf die Vegetation). Staub, Reinhaltung Luft, 21(2), 1961. 8 refs. Translated from German. Belov and Associates, Denver, Colo., 14p., April 30, 1970.

'Maximum Emission Concentrations' (MEC-values) are laid down to limit permissible emissions. They are derived from so-called tolerance limits which are obtained from the relationship between the emission and its harmful effect. In the case of the effects of sulfur dioxide on vegetation, it has been shown how the tolerance limits are obtained from the threshold-of-irritation function. They are not identical to the MEC-values which can only be derived from them by means of an additional definition. Above all, the permanently changing conditions of emission are decisive for this additional difinition. This must be taken into account if supervision of the MEC-values is to be made possible by the aid of air analysis. (Author summary)

8406 APTIC NUMBER 12260

Council for Living Environment (Japan), Experts Committee for Ambient Air Quality Standard
EXPERTS COMMITTEE REPORT FOR AMBIENT AIR QUALITY STANDARD (SULFUR OXIDES). Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), pagination not given, 1968.

The Council for Living Environment (Japan) recommended appraising the measured sulfur dioxide concentrations, creating a standard for judging the degree of SO2 pollution of the atmosphere, and establishing threshold concentrations to protect the population. The concentrations measured by the electroconductivity process as is suggested the SO2 index, used to determine the quality of the ambient air. The threshold values recommended by the Council are as follows: 0.05 ppm SO2 for the 24-hour average value and 0.1 ppm for the hourly value. The threshold concentrations should be subject to periodical examination and amendment.

8407 APTIC NUMBER 19297

Yoshida, Katsunori
AIR POLLUTION AND STANDARD OF JUDGEMENTS. (Taikiosen to hanteikijun). Text in Japanese. Koshu Eisei (Public Health), 33(2):64-69, Feb. 1969. 13 refs.

Problems concerning the determination of emission standards and the evaluation of factors suggestive of a relationship between air pollution and respiratory disease are discussed. Although a respiratory diease typical of polluted areas is at present defined in epidemiolcgical terms as a nonspecific chronic obstructive lung disease, the definition still remains ambiguous. It is possible, however, to identify some closely related factor which may determine the effect on respiratory organs, and this is the usual approach taken by physicians. Dominant factors indicative of the relationship can for the most part be determined by group medical examination covering prevalence, residential history of patients, age, sex, smoking, anamnesis, and other items viewed necessary. Emission standards can subsequently be determined by the results of such an examination, and the concentration of each specific pollutant constituting the air pollution concerned may be respectively evaluated. Some other factors to be considered in determining emission standards are maximum pollutant concentrations, variations in their occurrence, and the collective effect of diverse contaminants.

LEGAL AND ADMINISTRATIVE

8408 APTIC NUMBER 12238

Adolf, Gustof and Eric Holmquist
GOVERNMENT PROPOSITION NO. 122 IN THE YEAR 1968. HIS MAJESTY'S GOVERNMENT'S PROPOSITION TO THE RIKSDAG CONCERNING THE LIMITATION OF THE SULFUR CONTENT IN FUEL OIL: GIVEN AT STOCKHOLM CASTLE APRIL 19, 1968. (Kungl. Maj:ts proposition nr 122 ar 1968. Kungl. Maj:ts proposition till riksdagen angaende begransning av svavelhalten i eldningsolja; given Stockholms slott den 19 April 1968). 15p., 1968. Translated from Swedish. Franklin Inst. Research Lab., Philadelphia, Pa., Science Info. Services, 26p.

The burning of oil with sulfur content exceeding 2.5% by weight should be prohibited in Sweden after June 30, 1969. The government should be authorized to lower the permitted sulfur content of a fuel oil even further when economic and technical considerations are favorable. A graduation reduction of permissible sulfur content from 2.5% to 1% is anticipated. The responsibility for enforcing the suggested prohibition will be entrusted to provincial governments, who will be permitted to grant exceptions from the prohibition to plants having satisfactory gas purification systems. Local authorities will be granted the right to issue ordinances restricting the sulfur content of a fuel oil below 2.5. Fuel oil dealers will be required to indicate the sulfur content of a fuel oil at the time of its sale. Persons violating the injunction will be subject to a fine or imprisonment. Factors leading to the proposal are the increased acidity of precipitation and surface water in Sweden.

8409 APTIC NUMBER 19030

American Society for Engineering Education, Washington, D. C., Urban Engineering Study Committee
AIR POLLUTION ABATEMENT. In: Interdisciplinary Research Topics in Urban Engineering. A Report by the Urban Engineering Study Committee of the American Society for Engineering Education. NSF Grant GK-15688, p. 198-279, Oct. 1969. 16 refs.

Perhaps the characteristic element of the national approach to air pollution is its regional accent, as the Air Quality Act of 1967 provided a systematic effort to deal with the problem on an intermetropolitan basis. Exhaust emissions are the principal components of vehicular air pollution, and control technologies which are relatively well-developed include altering the mixture of air and fuel, timing adjustments, injection of air into hot exhaust gases, and advancements in engine design. Federal efforts are underway to stimulate the development of alternative energy, power, and propulsion systems. The principal Federal emphasis for the control of stationary sources of air pollution has been to date a series of studies instituted to provide a better definition of research and development needed to cope with any segment of this area. Significant research is also underway in improving current methods of forecasting and monitoring air pollution, while the types and costs of air pollution damage are being identified and assessed.

8410 APTIC NUMBER 19364

American Foundrymen's Society, Des Plaines, Ill.
LEGAL ASPECTS OF AIR POLLUTION. In: Foundry Air Pollution Control Manual. 2nd ed., 1967, Chapt. 3, p. 15-23.

Because of local differences in meteorology, topography, population, and type of pollution problem, limits on industrial emissions should be applied on a local rather than a nationwide or even statewide basis. The air pollution codes of Oregon and New Jersey are critically evaluated. A number of air pollution ordinances passed do not recognize the differences between foundry metal melting processes and combustion processes; hence certain provisions are being enforced that were designed specifically for combustion effluents and which cannot locally be applied to metal melting operations. In this light, the following are discussed: Ringelmann chart or other visual smoke inspection guides, equivalent opacity rule, adjustment to 12% CO2 or 50% excess air, and process weight. The provisions for interstate air pollution abatement contained in the Federal Clean Air Act of 1963 are described. Other legal aspects of air pollution control which are considered include approaching a nuisance, criminal intent, definition of a nuisance, enabling legislation, and suggested criteria of a good air pollution law.

8411 APTIC NUMBER 19921

Archer, A.
ADMINISTRATIVE PROCEDURES AND TECHNICAL RESOURCES FOR AIR CONSERVATION IN THE UNITED KINGDOM. (Massnahmen der Verwaltung und technische Mittel zur Reinhaltung der Luft in United Kingdom). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:351-358, 1970. 8 refs.

The administrative and technical aspects of air pollution control in Great Britain are reviewed. The National Ministry of Housing and Local Government administers the Alkali Act of 1906 and the Alkali Works Order of 1966, while the Clear Air Acts of 1956 and 1968 are administered by local government agencies. Problems relating to occupational health are administered by the Department of Employment and Productivity of the central government. At the end of 1968, a total of 1793 factories, performing 2970 individual operations, were registered with the Ministry of Housing. Supervisory work is handled by a chief inspector, 2 deputies, 12 district inspectors, and 11 inspectors, all professionally trained, and some with highly specialized knowledge and experience in the various fields involved. The administration of the Clean Air Acts is complicated by the fact that local government in England is divided at the moment among 1086 county district councils. A national study commission has recently recommended reduction of the number of local control agencies to 61, and the raising of professional standards for the local public health inspector. At present, responsibility for the regulation of hot blast cupola furnaces is borne by the Ministry of Housing, while cold blast cupola furnaces are supervised by the local agencies. In 1968, the Ministry of Housing issued a set of guidelines as an aid to the local agencies in regulating the emissions of the cold blast furnaces. The problem of calculating stack height is also reviewed.

8412 APTIC NUMBER 19439

Ayres, Robert U. and Allen V. Kneese
ENVIRONMENTAL POLLUTION. In: Federal Programs for the Development of Human Resources. 90th Congress, Second session, Joint Economic Committee, Subcommittee on Economic Progress, 58p., 1968. 40 refs.

An approach to the residuals problem is presented which does not use as central categories the conventional division between liquid, solid, and gaseous residuals. An attempt is made to account for residuals, regardless of form, resulting from the various materials and fuel-consuming economic processes and functions in national and regional economies. This approach provides certain general insights concerning the quantity of residuals generated, the factors bearing on this quantity, and about the failure of the market mechanism to deal appropriately with the entire resources allocation problem. The interdependencies between residual streams, which become so clear in this approach, also suggest that the conventional organization of government regulatory and management authority along the lines of the enviornmental media to which residuals are discharged - air, water, and the solid earth - need reexamination. Given the population, industrial production, and transport services in a region, it is possible to visualize combinations of social policy which could lead to quite different relative burdens placed on the various residuals-receiving environmental media; or given the possibilities for recycle and less residual-generating production processes, the overall burden to be placed upon the environment as a whole. While clearly experimental at this time, this approach could be developed and refined into a much more powerful technological-economic tool than has previously been available for projecting and analyzing environmental quality problems in regional and metropolitan areas. A regional or metropolitan area focus is the appropriate one, for it is at this level that the analysis of residual flows can be brought into meaningful relationship with the geographical, meteorological, and hydrological systems into which the waste residuals flow and understanding of which permits the analysis of concentrations, durations, and probabilities.

8413 APTIC NUMBER 19434

Ministry of Labour and Social Welfare, North Rhine-Westphalia, Germany
KEEPING THE AIR PURE IN NORTH RHINE-WESTPHALIA. (Reinhaltung der Luft in Nordrhein Westfalen). Congr. Reinhaltung der Luft, Duesseldorf, West Germany, 1969. (Oct. 13-17.) Translated from German. Belov and Associates, Denver, Colo., 133p., Feb. 11, 1970.

The centers of industrial concentration in North Rhine-Westphalia are also those of population concentration. The close juxtaposition of these concentrations of emittants of air pollutant material and the densely situated population causes extreme problems. The directed measures of the last ten years against the unbearable dust load and the harmful sulfur dioxide emissions have led to considerable improvements. Measurements show an extraordinary reduction of dust and SO2 in the air since 1963. While infringements on the dust limit values were found on 22% of the measurement surface at the beginning of the measurement period with 5% of the measuring surface violating the SO2 limit value, in the year 1968 violations were 5% for dust and 1% for SO2. These successes were predominantly due to severe licensing practices for new industrial plants and improvement programs for existing industries that do the most to determine emission concentrations: steel convertors, ore sintering plants, coking furnaces, foundries, and steam power plants. The experiences of the last few years have shown that the problems of air pollution are subject to change and have a continuous connection with the developments in technology and production in industry. An increase of around 25% to 5 million tons SO2 emissions per year is projected from 1967 to 1975. From 1975 on, the production of electric power, which will then account for 40% of the SO2 emissions, will be considerably influenced by atomic energy; SO2 emissions will first stop their increase and then start to decline. Fluorine, hydrocarbons, chlorine, and numerous odor substances will become the focus of attention. The dust problem will no longer be a question of loads due to coarse dust, but dangers to health due to fine dusts. Precipitation measurements will be extended to include concentration measurements. In the coming 10 years, the State will also take an increasingly critical look at emissions from automobiles and domestic heating units. The goal of the State Government is the development of a control system on a regional basis. Data banks will be set up to provide regional data on individual industrial emission sources, as a tool to the development of control programs. This program has already begun in the area of metropolitan Cologne and will soon be extended to the Duisburg/Oberhausen/Mulheim a.d. Ruhr, Essen/Bottrop, Gelsenkirchen/Wanne/Ficket/Bochum, Castrop/Rauxel, and Dortmund regions.

8414 APTIC NUMBER 19408

METHODS OF MEASURING DUST CONTENT IN STACK GAS. Japanese Industrial Standard JIS Z 8808, 34p., June 1963. 4 refs. Translated from Japanese. Belov and Associates, Denver, Colo., 67p., Jan. 28, 1970.

A method for sampling and measuring the dust and moisture content of industrial stack gases is established by Japanese public law. Conditions are specified for location for obtaining sample, method of sampling, and methods of analysis. A comprehensive discussion provides the history of the development of the standard as well as details of application.

8415 APTIC NUMBER 21685

Rettelheim, J.
SEMINAR ON THE CLEANLINESS OF THE ATMOSPHERE IN INDIA. (Seminar o cistote ovzdusi v Indii - Konference). Ochrana Ovzdusi, vol. 1, Oct. 1969. Translated from Czech. Belov and Associates, Denver, Colo., 3p., April 18, 1970.

The first seminar on air pollution problems in India, held in Durgapur on April 28-29, 1969, is briefly described. Durgapur is a city of 250,000 which originated as an industrial center about 12 years ago. Because of the areas's flat terrain and the

absence of naturally-occurring fog, conditions are favorable for the dispersion of pollutants. At present, there are no legal restrictions on atmospheric pollution in India; most pollution research is conducted by the Atomic Research Center Bhabha in Bombay and the Public Health Engineering Research Institute in Nagpuru. One of the papers given at the seminar reported a new method of quantitative differentiation between artificial and natural dust content in the air, based on the large difference between the ratio of the iron and potassium content in natural dust and in the solid particles from industry. The first results of long-term measurements of sulfur dioxide in the Bombay area were also presented.

8416 APTIC NUMBER 19059

Bistovish, Joseph M.
NASHVILLE'S AIR POLLUTION PROBLEM: PAST, PRESENT AND FUTURE. Vanderbilt Univ., Nashville, Tenn., School of Engineering, Tennessee Stream Pollution Control Board, Tennessee Dept. of Public Health, Proc. Conf. Environ. Water Resources Eng., 8th Ann., Nashville, Tenn., 1969, p. 171-177. (June 5-6).

The provisions and implementation of an air pollution control ordinance prepared by the Nashville Health Department are discussed. The ordinance regulates visible emissions from all fuel or refuse burning equipment. It is unlawful to burn any solid or liquid fuel containing more than 2% sulfur by weight. New incinerators must be multiple chamber incinerators having capacities of 100 lbs/hr with auxiliary heat sources to prevent air pollution. No incinerator may emit fly ash or other particulates in excess of 0.2 grain/cu ft. Automobiles and trucks may not emit visible air contaminants in excess of Ringelmann No. 1. The ordinance also regulates odors, dusts, and emissions from laundries, dry cleaning plants, and similar operations. The air pollution control division is divided into three sections: engineering, enforcement, and laboratory. The progress of implementation of the ordinance is also discussed.

8417 APTIC NUMBER 21665

Burton, Ellison S. and William Sanjour
MULTIPLE SOURCE ANALYSIS OF AIR POLLUTION ABATEMENT STRATEGIES. In: Economics of Air and Water Pollution. William R. Walker (ed.), Blacksburg, Virginia Polytechnic Institute, Water Resources Research Center, 1969, p. 209-229.

An analytical approach to air pollution abatement uses interrelated computer programs, data files, and special techniques to simulate the source-by-source pollution control in a geographic area so that any number of prospective abatement strategies can be compared for cost and effectiveness. There are four types of inputs: data on emission control alternatives; data on the availability and cost of fuels; a detailed emission inventory of the sources in the area; and receptor point grid locations and frequency distributions of wind vectors. Abatement analysis begins with a listing of the emission control alternatives, such as fuel substitution and control devices, to be applied to a model of each source. Cost analysis estimates the annual cost and the effectiveness of the emission control alternatives available to each source. A computerized meteorological diffusion model determines the concentration of a pollutant at a receptor point per unit emission from each source point. Sets of solutions can be computed for any combination of cost and emission constraints, providing a basis for assessing the economic efficiency of any strategy. Some applied results of this approach are discussed in detail.

8418 APTIC NUMBER 19021

Fensterstock, Jack C., Jerry A. Kurtzweg, and Guntis Ozolins
REDUCTION OF AIR POLLUTION POTENTIAL THROUGH ENVIRONMENTAL PLANNING. Preprint, Air Pollution Control Association, New York City, 38p., 1970. 1 ref. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-19, 1970.)

The unplanned consequences of human activities on the environment have become sufficiently apparent to cause nationwide concern. Even when there has been a conscious effort on the part of the planners to consider environmental aspects, the effects of planning on air quality have generally not been included in the evaluation. Although achieving and maintaining desirable levels of air quality will depend primarily upon mechanical controls and fuel and process changes, introduction of air pollution considerations into the planning process in many cases can provide a supplementary means of reducing both emissions of pollutants and exposure of persons to high ambient concentrations. Three general areas where air pollution considerations can be introduced into planning and decision-making processes have been identified: large-scale and long-term urban development, roadway design, and the design and location of structures. For each of these, the National Air Pollution Control Administration has initiated projects from which guidelines for planning will be issued. Initial efforts in this area range from the evaluation of various transportation systems for the Seattle metropolitan area to the design of a specific roadway configuration in New York City. One study estimates motor vehicle emissions for two alternative metropolitan land use plans proposed for the Puget Sound region. Total motor vehicle emissions varied appreciably between the two plans. A second study measured the variations in pollutant concentrations at various vertical and horizontal distances from existing roadways. Relationships are being established between meteorological factors, traffic flow characteristics, and pollutant concentrations that will assist in predicting the environmental impact of proposed roadways. For a program of this nature to be successful, air pollution control agencies must work closely with other groups concerned with the environment, such as the urban and transportation planning groups. Such groups must be cognizant of the interrelationships that exist among their activities.

8419 APTIC NUMBER 21972

Commission on Earth, Water and Air, Rotterdam
COMMISSION ON EARTH, WATER AND AIR-ROTTERDAM. REPORT ON THE YEAR 1967. (Commissie bodem, water en lucht - Rotterdam. Verslag

over het jaar 1967). 82p., 1968. Translated from Dutch. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 128p., Oct. 30, 1969.

Activities relating to combatting the pollution of earth, water, and air are reported. Such diverse subjects as the formulation of regulations governing the transport of dangerous materials on roadways and the removal and incineration of wrecked automobiles are considered. Significant progress was reported in the identification and control of land and water pollution. In the area of air pollution control, the conversion of municipal electric power plants to natural gas fuel was reported. Contracts for new municipal facilities now specify that all new installations restrict smoke and soot to Ringelmann No. 2 rating or less. The manner of compliance of 6 industries to orders to make provisions against air pollution are summarized, as are 4 others in the process of complying. Guidelines were established relating to the maximum permissible discharge of 10 injurious and/or irritating substances. A folder was issued requesting motorists to shut their motor off when waiting for open drawbridges or in long lines of traffic. Air pollution in the area went down 'strongly and absolutely' in the 1962-1966 period, indicating that the conditions set forth by the authorities and the efforts made by the plants were largely successful. Cases of public nuisances on a large scale occurring during the year were the results of sudden and unforeseeable '(or at any rate unforeseen)' plant disturbances.

8420 APTIC NUMBER 19144

Hansell, William A.
THE GEORGIA STATE AIR QUALITY CONTROL PROGRAM. Vanderbilt Univ., Nashville, Tenn., School of Engineering, Tennessee Stream Pollution Control Board, and Tennessee Dept. of Public Health, Proc. Conf. Environ. Water Resources Eng., 8th Ann., Nashville, Tenn., 1969, p. 179-190. 4 refs. (June 5-6.)

Air quality legislation enacted in Georgia in 1967 gave the state Board of Health the power to establish air quality standards for Georgia; to prescribe for the prevention, control, and abatement of air pollution; and to require the registration of all persons engaged in operations which may result in air pollution. Within the Air Quality Control Branch there are two groups, each headed by a director: the Air Pollution Control Service and the Air Quality Evaluation Service. The former has six pollution control specialists on its staff; the latter, four. Included in the article are data on thermal inversions over Georgia; average concentrations (1962-1967) of oxidants, nitrogen dioxide, sulfur dioxide, and suspended particulates in seven Georgia communities; and yearly composites (1965-1968) for the Georgia Air Sampling Network of suspended particulates, beta radioactivity, lead, and benzene solubles.

8421 APTIC NUMBER 19004

Havighurst, Clark C.
A SURVEY OF AIR POLLUTION LITIGATION IN THE PHILADELPHIA AREA. Duke Univ., Durham, N. C., School of Law, NAPCA Contract CPA-22-69-112, 54p., Dec. 10, 1969. 40 refs.

A study of recent private air pollution litigation in the area of Philadelphia, Pennsylvania, for the purpose of generating information useful to the government in estimating the economic effects of air pollution is described. Ideally, the data discovered would permit the extrapolation from specific damage findings to estimates of gross damage in a particular community. A number of interesting case histories are reported. An effort is made to understand the relationship between economic and legal damages and to conceive of a manner in which legal damages could be made to serve a function for economists. An outline of how a more useful project focusing on damage awards in private litigation is given. The methodology of the survey, techniques used, and difficulties encountered are evaluated. Each case that was investigated is appraised for relevency.

8422 APTIC NUMBER 19336

Hockin, L. F.
PRESENT LEGISLATION AND POSSIBLE FUTURE TRENDS IN AIR POLLUTION CONTROL. Preprint, Inst. of Mechanical Engineers, London, (England), 7p., 1968. 4 refs. (Presented at the Symposium of the Institution of Mechanical Engineers, London, England, Oct. 17-18, 1968.)

Air pollution legislation in England and Wales is reviewed with special reference to the Alkali Acts, the first of which was passed in 1868, to control the discharge of hydrochloric acid from the Leblanc process for manufacturing sodium carbonate. Over the years, the act was extended to include more processes and more noxious or offensive gases, the extensions resulting in the Alkali & Works Regulation Act of 1906 and the Alkali & Works Order of 1966. At the end of 1967, 1828 works involving 3031 separate processes were registered under the act. The essence of the act is that all scheduled works must use the best practicable means to curb emissions; plants are judged not by the measures they have taken but by the degree of success they achieve in practice. Inspection of a registered works is carried out continually and usually without notice. The other main acts controlling air pollution are the Public Health Act of 1936, which empowers local authorities to specify abatement procedures for a specific emission source, and the Clean Air Act of 1956, which gives local authorities the right to control emissions of smoke, dust, and grit from fuel combustion, to control chimney height, and to set up smoke control areas. A Clean Air Bill currently before Parliament would bring a wider range of furnaces under the control of the grit and dust provisions of the Clean Air Act and establish a more comprehensive system of controlling chimney height. New Alkali & Works Orders will likely have specific provisions for oil refineries and petrochemical processes, mineral processing, odors from the processing of animal wastes, and primary aluminum smelting.

8423 APTIC NUMBER 19520

Ireland, F. F.
DETERMINATION OF STACK HEIGHT IN ENGLAND. (Die Bestimmung der

Schornsteinhoehen in England). Text in German. VDI(Ver. Deut. Ingr.) Ber., no. 149:180-186, 1970. 9 refs.

Provisions of the Clean Air Acts of 1956 and 1968 are discussed. After application to build a plant has been received by a local board, a decision must be rendered to the applicant as to the minimum permissible height of the smokestack to be installed. The board must determine what height shall be suitable for protecting the health of residents in the vicinity, and must register their decision with the applicant within four weeks. Otherwise, it is assumed automatically that the application is granted. The board has a list of 56 different types of plants that are considered responsible for harmful emissions. The Alkali Act, first passed in 1863, and since expanded, regulates emission standards for various types of chemical plants, especially those dealing with the manufacture of alkali salts. Due to the large number of variable factors involved it is almost impossible to determine chimney height by any simple mathematical formula or by any purely scientific line of reasoning. With due caution, it is possible to use sulfur dioxide measurements as indicator values to give a picture of the dispersion of pollutants. Difficulties are encountered in deciding which meteorological factors shall be considered in the calculations, whether calculations should be based on extreme conditions which seldom occur, and whether the most highly susceptible and sensitive human beings shall be used as a standard for harmful effects. Great Britain does not have a set of maximum allowable concentrations to which one can appeal. Due to the more intense air movement in Great Britain, this area does not experience as serious pollution problems as the European continent. In August 1961, the Ministry of Housing published recommendations on chimney height, worked out by the Warren Spring laboratory. Areas are defined as rural, partially developed, residential, urban, and metropolitan, these classifications affecting the calculations. If the fuel contains more than 2% sulfur, a correction factor is added. Provisions for differentiating among the various types of plants and their respective emissions are discussed.

8424 APTIC NUMBER 21716

ITS THE LAW. Philadelphia, Delaware Valley Citizen's Council for Clean Air, 1969 (7), 35p.

The air pollution control regulations of the Penjerdel region (Philadelphia, New Jersey, and Delaware) are briefly summarized. In addition, the full text of Philadelphia's new Air Management Code is included. The code specifies the criteria for evaluating the emission of one or more air contaminants and requires the adoption of facilities to reduce sulfur dioxide emissions as well as periodic stack tests. Installation permits and operating licenses must be obtained for all combustion and process units and air cleaning devices. The responsibility for administering and enforcing the code rest with the Department of Public Health.

8425 APTIC NUMBER 19314

NAPCA 'EMISSIONS' REPORT RECOMMENDS NATIONAL AIR QUALITY STANDARDS. J. Air Pollution Control Assoc., 20(7):472-473, July 1970.

The recommendations of the National Air Pollution Control Administration concerning national air quality standards are summarized. Large stationary sources of pollution are significant contributors to the deterioration of community air quality, and are sometimes the major contributors to pollution in specific areas. Three methods of adopting and enforcing emission limitations for major stationary sources are outlined. The first is to apply national emission standards to stationary sources. The second involves the designation of air quality control regions by the States; the adoption of national emission standards for pollutants which are hazardous to public health; and the application of the best technology to control new sources. The third method involves the Department of Health, Education, and Welfare establishing national ambient air quality standards, with the States adopting implementation plans for their entire territory. The States would be required to hold public hearings before adopting implementation plans; thus, there would be continued public involvements in planning for air pollution control. The States are expected to assume the primary responsibility for enforcement activites. In all cases, however, the Federal Government must have the power to undertake enforcement action if a State fails to meet its responsibility.

8426 APTIC NUMBER 19477

Kennan, George F.
TO PREVENT A WORLD WASTELAND. A PROPOSAL. Foreign Affairs, 48(3):401-413, April 1970.

After a discussion of present international efforts and organizations dealing with environmental problems and the difficulties involved, a proposal is made for the creation of an international environmental agency, initiated and supported by the leading industrial nations of the world. It would be staffed and controlled by a major scientific institution (e.g., an Academy of Science) from each founding country, and operated by scientific and technical personnel with a negligible connection to their respective governments. Early tasks of such an agency would be to establish the major needs of environmental conservation in several fields, to critically review the work and prospects of organizations now in existence in relation to these needs, and to make recommendations on how to fill the gaps which exist. It is envisioned that at a later time, under multilateral treaties, the agency might assume international enforcement functions, thus expanding to become an international environmental authority. The observation is made that, organizationally, natural resource conservation and 'watchdog' functions should be completely separate form development and exploitation functions, and that of the two, conservation should take priority. 'The principle should be that one exploits what a careful regard for the needs of conservation leaves to be exploited, not that one conserves what a liberal indulgence of the impulse to development leaves to be conserved.'

8427 APTIC NUMBER 21947

Mendoza, Alfredo Perez de and Walter P. Reinking
PROGRAM FOR THE CONTROL OF AIR CONTAMINATION IN MEXICO CITY. Preprint, 23p., 1968. (Presented at the Symposium on Air Contamination, Mexico City, Mex., Dec. 9, 1968.)

The air contamination problem in Mexico City was defined in terms of quantities of specific pollutants in the atmosphere. Of the total gas contamination, sulfur dioxide, nitrogen dioxide, and carbon monoxide constitute 81%. On a comparative basis, it had a problem of the same order of magnitude as Chicago. Blame for the problem was directed at mankind in large numbers. A secondary culprit was defined as the automobile. A federal program was requested and a proposed program presented. The steps considered most important in the program were delineated. Principle among these were a complete study of atmospheric contamination conditions and control of contamination coming from automobiles; it is estimated that in 1969, 565,000 tons of contaminants will be emitted.

8428 APTIC NUMBER 21829

Morgan, George B. and Guntis Ozolins
AIR QUALITY SURVEILLANCE. Preprint, California State Dept. of Public Health, Berkeley, California Air Resources Board, Los Angeles, Public Health Service, Washington, D.C., National Air Pollution Control Administration and California Univ., Berkeley, 20p., 1970. 6 refs. (Presented at the Conference on Methods in Air Pollution and Industrial Hygiene Studies, 11th, Berkeley, Calif., March 30, 31 and April 11, 1970.)

The basic concepts of network design for Air Quality Control Regions (AQCR) are presented to serve as guidelines for network development. Parameters considered include the selection of pollutants to be measured, the determination of the number and location of sampling sites, the selection of appropriate instrumentation, analytical techniques and sampling frequencies, and the development of applicable data handling and analysis procedures. The design of the Metropolitan St. Louis Interstate Air Quality Control Region is used to illustrate the concepts.

8429 APTIC NUMBER 21980

National Academy of Sciences-National Academy of Engineering, Washington, D. C., Environmental Study Group
INSTITUTIONS FOR EFFECTIVE MANAGEMENT OF THE ENVIRONMENT. PART I. 70p., Jan. 1970.

A study was conducted to determine if there existed an adequate institutional base to deal with the mounting environmental problems. It was concluded that the present institutional arrangements for effective environmental management are inadequate, and a number of recommendations aimed at improving them were made. Included was the establishment of a Board of Environmental Affairs to recommend the establishment of policies and to evaluate programs and activities of departments and agencies and to consider how these activities will affect the environment. Establishment of a joint committee of the Congress to interface with the Executive Branch on environmental affairs was recommended. The committee would be composed of the chairman and ranking minority member of the relevant committees of both houses. Also recommended was the establishment of a National Laboratory for the Environmental Sciences, an Institute for Environmental Studies, multidisciplinary programs of environmental affairs within existing universities, an experimental, problem- oriented graduate school, and a Junior Environmental Educational Program to be developed and sponsored by the National Science Foundation and directed to the involvement of youngsters at the secondary school level with the whole range of environmental affairs. A comprehensive federal program for monitoring of the environment was urged. This would include as a minimum, physical and chemical properties of land, air, and water; distribution of plants and animals in land, air, and water; land use; construction; noise, epidemiology of man, animals, and plants; evidence of environmental stress, such as the consumption of tranquilizers and asocial behavior; and aesthetic qualities. Research to develop and maintain environmental quality indices should be encouraged and supported. Representative indices include transparency of air, purity of water, ratio of open-ground area to population, noise level, ratio of wild animals to human population, ratio of park areas to parking lot areas, and fraction of utility wires above ground.

8430 APTIC NUMBER 19087

National Academy of Sciences, Washington, D. C., Panel on Technology Assessment
TECHNOLOGY: PROCESSES OF ASSESSMENT AND CHOICE. Report to the U. S. House of Representatives Committee on Science and Astronautics, 177p., July 1969. 54 refs.

In recent years, concern has mounted over society's seeming inability to channel technological developments in directions that sufficiently respect the broad range of human needs. Technology assessment was selected as the focus in the exploration of trends in technological development. From there, the study expanded to consider the effects on society, the environment, and the individual effects of such trends. Existing mechanisms, whether they involve government agencies, private industries, or professional groups, possess intrinsic limitations, some structural and others psychological, that leave serious gaps in the spectrum of processes that assess and direct the development of technology in our society. The present organization of private and public assessment systems is too fragmented and uncoordinated, too lacking in professionalism, continuity, and detachment to provide a viable institutional basis for the support of the research and education that a sufficiently broad technology-assessment program will demand and for the development of the professional competence and vision that such a program will require. The creation of new institutions in the federal government is recommended to perform the integrating functions of review and stimulation. The present multiplicity of technology-assessment processes is recognized as both desirable and necessary. The new institutions are needed to supplement, not supersede, them. The creation of a constellation of organizations is urged, with components located strategically within both political branches, that can create a focus and a forum for responsible technology-assessment activities throughout government and the

private sector. Limited at the outset to those areas of technology that are strongly and directly influenced by federal policy, such organizations must be separated scrupulously from any responsibility for promoting or regulating technological applications and must have the authority and resources for undertaking substantial pertinent in-house studies, supporting major research activities in external organizations, and encouraging activities and programs related to the stimulation of public awareness of, and interest in assessment issues and the education and development of professional groups with broadened perspectives to staff future technology-assessment activities in industry, in government, and in other institutions.

8431 APTIC NUMBER 19687

Nishihara, Michio
LEGAL ASPECTS IN THE INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL DISRUPTION. PART I. (Kogaimondai kokusaishimpojumu ni okeru kogai no hoteki sokumen). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):14-16, June 15, 1970. 4 refs.

Legal aspects of public nuisances as discussed in the international symposium by jurists from different countries are described and interpreted. The necessity of establishing international cooperation, especially legal systems such as water rights, was pointed out, and the legal structure of a country actually obstructing the anti-nuisance measures to be established was also indicated. The difficulty of organizing the jurist from all over the world in the specific task of controlling public nuisances is attributed to such factors as tradition, national character, and the legal interpretations that exist in different countries which hinder discussion of nuisance problems on a common ground. In order for jurisprudence to contribute to international cooperation beyond the barriers of academic specializations, it is necessary to emphasize the functional aspects of legal systems and to place the value judgement forming the foundation of legislations and interpretations on a more appropriate basis. Law has always worked together with natural science and technology, but in important problems of establishing standards of choosing between the benefits and values of economic expansion or a comfortable living condition, for example, cooperation with other branches of social science is necessary. The main focus of the symposium was on the question of the gross national product (GNP) as an appropriate indicator of the level of welfare. It was unanimously agreed that GNP does not include destruction of natural resources and social losses due to public nuisances, and that to entering the output from public nuisance-producing industries as positive quantities is unreasonable. In journalism, as well as the governmental circles, the tendency to reject the all-importance of GNP has begun to appear and is very encouraging to those studying nuisance control. In causing nuisances, the originator is expected to be held responsible for the damages to others, and in such cases the protection of property rights and rights to continue operation does not make sense. Furthermore, if that industry's existence is threatened by the cost of repaying the damage, then it does not qualify to exist, since it contributes more tho the loss of society as a whole.

8432 APTIC NUMBER 19518

Oels, H.
EUROPEAN COOPERATION IN THE AREA OF AIR POLLUTION CONTROL. (Die europaeische Zusammenarbeit auf dem Gebiet der Luftreinhaltung). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:20-26, 1970.

An 18-member organization of European states, 'Europarat,' has the task to cope with social, cultural, scientific, legal, economic, and administrative problems occasioned by the present technological revolution. It has formulated a set of guidelines for the international control of air pollution: the originator of pollutants shall be responsible for keeping emissions to a minimum and making adequate provisions for their dispersal; air pollution legislation must make provision for future needs; member states must provide suitable administrative organizations concerned with monitoring, enforcing regulations, and working for improved conditions; adjustments must continually be made to technological advances; provisions need to be made for handling special situations and emergencies; cost of the pollution control program should be carried primarily by those responsible for originating the pollutants; pollutants affecting a frontier area shall be under a joint control program in which the governments of the countries involved cooperate and use common standards; city and industrial planning should make advance provisions for air pollution problems, such as the creation and maintenance of 'green belts' within the urban-industrial complex. Further international cooperation is to be found in an organization for economic cooperation and development of European Atlantic States, the World Health Organization, and the World Meteorological Organization. There are also bilateral ventures, such as that of Sweden and Germany, whose goal is to reduce harmful substances in waste gases, especially nitrogen oxides, limitations on the addition of lead to gasoline, and the desulfurization of fuels (emphasis on liquid fuels in Sweden, on solid fuels in Germany).

8433 APTIC NUMBER 19156

Rose, D. J., M. I. Adler, M. G. Anderson, S. I. Auerbach, S. E. Beall, J. C. Bresee, L. D. Chapman, F. E. Cowser, P. L. Culler, J. W. Curlin, P. Datz, J. M. Gibbons, F. A. Gifford, S. M. Haaland, F. C. Wise, A. Hollaender, J. S. Johnson, J. L. Liverman, A. L. Lotts, M. G. MacPherson, Claire Nader, Kathryn Nelson, D. J. Nelson, J. S. Olson, H. Postma, I. Spiewak, J. B. Storer, M. S. Wechsler, A. M. Weinberg, R. P. Wichner, and M. F. Yarosh
THE CASE FOR NATIONAL ENVIRONMENTAL LABORATORIES. Oak Ridge National Lab., Tenn., Contract W-7405-eng-26, ORNL-TM-2887, 65p., Feb. 1970. 17 refs.
CFSTI: PB 189691

The establishment of several large generalized National Environmental Laboratories (NEL), each containing interacting groups of natural and social scientists, engineers, and information specialists, is recommended. Their field of action would be the whole environment, both rural and urban, both present and future. By their organization and outlook, NELs would take a different cut across the fabric of environmental problems than has been possible. Tasks previously considered separately, the retrospective ones of restoring and preserving the environment and the prospective ones of future technology assessment, would be

joined in NFIs. These structures and roles are said to be what is required to implement both the recommendations of the National Academy of Sciences Panel on Technology Assessment and the requirements implicit in the National Environmental Policy Act. The goals of the NFIs would be: (1) for problems affecting the existing of future environment, to develop and present to policy-makers ordered sets of alternates whose relative costs and benefits would be clearly defined, and (2) to make sure that all sectors in the nation can be aware of available options. NFIs would have 5 general activities, programmatic perception, information gathering and processing, systems analysis, research and development, and communication. Important national problems that now do not seem to fit present organizations but would fit NFIs are power for the future, environmental indices, assessing direct hazards to man resulting from introduction of chemical and physical agents into the environment, waste management, and recycling of materials. Agencies and organizations presently concerned with environmental problems would retain their being and function. The NFI role is now unfilled, but could gradually by assumed by existing large laboratories. In the Federal Government structure, NFIs appear to fit best into a separate organization reporting jointly to Congress and to the Executive Branch.

8434 APTIC NUMBER 19923

Roussilhe, Andre
CITY PLANNING AND AIR POLLUTION. (Urbanisme et pollution atmospherique). Text in French. Pollut. Atmos. (Paris), vol. 12:13-22, May 1970.

The director of Planning and Housing in Paris discusses current problems in city planning as they relate to air pollution. City planning involves the zoning of industries to isolate them from residential areas; the centralizing of home heating for increased efficiency in exhaust purification; improvements in the flow of traffic and parking conditions, as a way of reducing automotive exhaust problems; the maintenance of areas planted with vegetation. In density of permanent inhabitants, the city of Paris proper is exceeded only by Bombay, India, with 3 million Parisians living in an area of less than 10,000 hectares. Even Manhattan, in New York City, has a permanent population of only 1,900,000.

8435 APTIC NUMBER 19920

Seidl, W.
AIR CONSERVATION LITERATURE -- HOW IT IS OBTAINED, EVALUATED, AND PUT TO USE. (Die Literatur ueber Reinhaltung der Luft -- ihre Erfassung, Auswertung und Nutzbarmachung). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:359-366, 1970.

As is true for scientific disciplines in general, there has been a 'literature explosion' on the subject of air pollution control. The USA is far in the lead in the production of such literature, followed by the USSR, West Germany, England, France, and Italy. Other countries were contributing about 19% of the literature, as of 1963. The VDI (Society of German Engineers) began an air pollution documentation service in 1957. The storage unit now contains better than 40,000 titles and over 230,000 card entries, arranged on a 3-track system in terms of type of pollution, emission source, and main subject. A description is given, with illustrative examples, of the manner in which material is stored and retrieved.

8436 APTIC NUMBER 19213

Shidara, Masao
LECTURES ON PUBLIC NUISANCE. AIR POLLUTION PREVENTION (1). (Kogai boshi koza. Dai 1 ho Taikiosen boshi (jyo)). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22(6):40-48, June 30, 1970.

Part one of a series of lectures on public nuisances is presented. Countermeasures for sulfur dioxide, prevention of water pollution, and countermeasures for noise are to follow. Items considered as public nuisances are listed. The lowering of ground due to mining is excluded. In the section on a fundamental law for public nuisance countermeasures, the purpose of the law, the duties of business proprietors and residents, annual reports, environmental standards, emission controls, a public nuisance prevention plan, settlement of disputes, and public nuisance countermeasure conferences are explained. In Japan, dust and smoke were the original objects of air pollution control. With the rapid development of industrial economy, however, sulfur oxides from industries and automobile exhausts became the primary object of the control after 1968. The purpose of air pollution control, definition of the pollutants, specified pollution control areas, emission standards, and procedures for installing smoke-generating facilities are reviewed. Emergency measures and administrative action to be taken in the case of smog are noted. Permissible limits for automobile exhaust, as decided by the Minister of Transportation in consultation with the Minister of Health and Welfare, are indicated.

8437 APTIC NUMBER 19335

Train, David
AN APPROACH TO THE TREATMENT OF POLLUTING AIRBORNE DISCHARGES. Preprint, Inst. of Mechanical Engineers, London (England), 10p., 1968. 2 refs. (Presented at the Symposium of the Institution of Mechanical Engineers, London, England, Oct. 17-18, 1968.)

Where plant emissions are regulated by law, it is important for plant management to view in perspective what the legislation sets out to do. This can be done by dividing the removal of waste materials into two phases in sequence. Phase I covers the period from the time the material is disengaged from the main process stream until it is discharged from direct control of the management responsible for producing it. It is the period when the safety of the worker could be placed in jeopardy. Phase II covers all aspects of disposal after the rejected material passes beyond this direct control. In the great majority of plants, sufficient negative pressure is induced so that there is little risk of hazardous gases, vapors, and fumes in work areas. Once the gases and vapors are contained together with associated

particulate and/or droplet matter, the plant can be utilized for transport, treatment, and disposal. Transport of the gases requires that the changeover from negative to positive pressure be effected at optimum fan position. The selection of a particular treatment for a waste gas stream depends on the nature, form, and concentration of its constituents. The safe discharge of the processed gas stream is still a management responsibility but involves the community in general. Most frequently, the problem with community requirements is only one of amenity, and the difficult judgment to make is the degree to which action may be demanded and conceded in order to provide a reasonable solution on both sides. Because individual olfactory sensitivity can detect dilutions of some organic materials beyond the limits of analytical measurement, it can be difficult to judge improvements that might be made in plant performance.

8438 APTIC NUMBER 21726

Vancura, J.
PROTECTION OF THE ATMOSPHERE IN CZECHOSLOVAKIA. Ochrana Ovzdusi, vol. 1, Jan. 1969. Translated from Czech. Belov and Associates, Denver, Colo., 17p., April 20, 1970.

Objectives of new Czech air pollution legislation are to provide future and existing industries with the technology for controlling pollutants, to initiate a program of plant inspection and of fees and fines for air pollution; and to consider alternatives to the existing fuel and power base. The three agencies responsible for administering and fulfilling the law are divisions of the Ministry of Forestry and Water Economy: the Department of Atmospheric Protection, the State Technical Inspection for Atmospheric Protection (STIO), and the Hydrometeorological Institute. The first division is concerned with the solution of conceptual questions of atmospheric pollution, the location of industrial and power facilities, and research and development of technical equipment. STIO systemically checks the larger sources of pollution and reviews the technical level of separation facilities as well as the technological processes which result in noxious materials. The Hydrometeorological Institute studies and measures pollution in the lower layers of the atmosphere and evaluates meteorological parameters influencing the distribution and concentration of pollutants in the atmosphere. About 50% of the cost of control facilities will be subsidized by the Ministry of Forestry and Water Economy from the fees paid by pollution sources. Special consideration is being given to coal desulfurization processes and to the possibilities of increasing the use of gaseous and liquid fuels and importing power or constructing nuclear power plants. With the present fuel and power base, it is estimated that sulfur dioxide emissions will reach 3 million annually by 1980, even if control measures are adopted.

8439 APTIC NUMBER 19806

Walsh, George William and Darryl J. Von Lehmden
ESTIMATING MANPOWER NEEDS OF AIR POLLUTION CONTROL AGENCIES. Preprint, Air Pollution Control Association, New York City, 22p., 1970. (Presented at the Air Pollution Control Association Annual Meeting, 63rd, St. Louis, Mo., June 14-17, 1970, Paper 70-92.)

Executives, administrators, and planners of air pollution control agencies are concerned with the preparation of manpower estimates for budget requests, development of recruitment plans, and other processes. A discussion of a manpower model is presented that was designed to supplement other approaches to estimating manpower needs. The model, based on the major functions that a comprehensive control agency must perform to control or prevent air pollution, is dependent upon four readily available characteristics of the agency's jurisdictional area to provide primary estimates for four key functions: air monitoring, scheduled inspections, field patrol and complaint handling, and operation of a permit system. Discussion is also provided on factors that can effect model estimates and verification of results. (Author abstract)

8440 APTIC NUMBER 19064

Yocom, John E.
AIR POLLUTION REGULATIONS-THEIR GROWING IMPACT ON ENGINEERING DECISIONS. Chem. Eng., 69(15):103-114, July 23, 1962. 9 refs.

Choice of raw materials, equipment, process variables, plant site, and plant size are all affected by air pollution control requirements. How the regulations work, how they are enforced, and the direction in which they are moving are reported. Local control agencies and state and federal agencies are becoming increasingly interested and active in the area of air pollution control. Various geographical areas are discussed with California getting the major emphasis as the state which has pioneered most of the air pollution control activities. The three broad categories into which control agencies divide emissions into the atmosphere are identified as visible, particulate, and gaseous. One significant and universally accepted policy is that where regulations overlap, all applicable regulations must be complied with. The most widely used type of control regulation for visible emissions is based on the use of the Ringelmann chart. Originally conceived to evaluate shades of grey in smoke plumes from coal fired boilers, its extension to non-grey plumes through the principle of equivalent opacity has created serious problems in interpretation and enforcement. Wet or detached plumes also are the subject of controversy. Regulations covering the control of particulates are generally based on stack concentrations or percent of process weight. The latter concept was conceived by the Los Angeles County Air Pollution Control Department to prevent circumvention of the intent of regulations by diluting stack air. A variation of the stack concentration concept is permitted by the Bay Area Air Pollution Control District which accepts readings based on ground level concentrations. Only a few control agencies have specific limits on SO2 emissions. Most of these are in California and base their regulations on the LACAPCD limit of 0.2 by volume calculated as SO2. Flourides are controlled "to the extent technically feasible" in San Bernardino and to a limit of 40 ppm in forage grass by the Florida Air Pollution Control Commission. Carbon monoxide remains an automotive problem and will probably not concern the processing industries until the auto makers have finished with it. The trend is to have enforcement remain with local and district agencies with policy and research being handled at the state and federal levels.

8441 APTIC NUMBER 19139

Goetz, Charles
PUBLIC V. PRIVATE GOODS. Virginia Polytechnic Inst., Blacksburg, Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p. 22-28.

The concept of public good as it relates to the use of natural resources is discussed. The two conditions by which an economist defines a public good are jointness and non-excludability. In many cases, complicated questions of value judgments, legal rights, and cost-benefit analyses become involved. Attempts to allocate air and water use by giving priority to social goods over private goods are based upon a completely illusionary dichotomy, since all uses of air and water are private in the sense that they benefit individuals, and most uses of air and water are social goods in the sense that they benefit groups of individuals, whether large or small.

8442 APTIC NUMBER 19689

Isomura, Takafumi
ECONOMIC ASPECT OF ENVIRONMENTAL DISRUPTION DISCUSSED AT THE INTERNATIONAL SOCIAL SCIENCE SYMPOSIUM. (Kogaimondai kokusai shimpojusu ni okeru kogai no keizaiteki sokusen). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6): 423-427, June 15, 1970.

The fundamental goal of the international symposium was to discuss public nuisances as a challenge to social sciences, and to investigate various countermeasures against them. Basic flaws in the private enterprise system leading to public nuisances were identified as the problem of one economic unit imposing an external uneconomy on another unit. The weakness of Japan's basic public nuisance legislation following the idea of 'harmony with economic expansion' was also pointed out. Another topic was that of quantifying the welfare of the citizens in a country by means of the gross national product inclusive of such negative quantities as damage due to public nuisances. The input-output matrix system as devised by Leontief can be used to calculate the cost of preventing and eliminating public nuisances and to demonstrate to whom the cost is imposed, which ultimately turns out to be the household sector of the economy. Further discussions concerned the existence of public nuisances irrespective of political system, as evidenced by the pollution problems the USSR is experiencing. No matter what the political system, as long as the private interest of individual economic sectors leads to disparate activities, nuisances do arise. The necessity of restructuring and re-directioning the value system under a more centralized administrative organization was suggested. Different means of controlling public nuisances were discussed, including direct controls, subsidy to polluting industries, tax reduction, imposing prices on pollutants in the same way sewage services are priced, and the advantages and disadvantages of such methods were indicated. Alternatives to the eventual control of nuisances include the provision of economic stimuli leading to the establishment of environmental quality standards, and the revamping of the political structure under which nuisances occur. In view of the possibility that economic stimuli might simply result in higher prices for the consumers, it is certainly reasonable to surmise that correct and responsible political decisions will play a large role in future control of public nuisances.

8443 APTIC NUMBER 19492

Kiyoura, Naisaku
MANY ASPECTS OF THE INTERNATIONAL SOCIAL SCIENCE SYMPOSIUM. (Kogaimondai Kokusaishinpojusu ni shusseishite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):439-444, June 15, 1970.

The major topics with which the International Social Science Symposium was concerned are summarized and discussed. The topics fell into two categories, one concerning environmental disruption and the other related socio-economic systems. The symposium gave equal consideration to two opposing viewpoints: one that environmental disruption is closely related to social and economic systems and one that holds that they are unrelated. Regardless of the socio-economic system, a society must look for proper measures to control environmental disruption. In this connection, the success of Pittsburgh can serve as a guide. It was concluded that environmental disruption should be included in the GNP as one type of depreciation, even though economic losses are difficult to assess. The symposium also noted that the social and natural sciences must collaborate to develop means of pollution control.

8444 APTIC NUMBER 17630

Kogo, Tetsutaro, Ryosaku Fado, Tatsunori Oyake, and Hiroshi Shirakawa
OFFENSIVE ODORS. 9. INVESTIGATION OF THE EXISTING CONDITIONS IN HOKKAIDO WITH RESPECT TO OFFENSIVE ODORS (FIRST REPORT). INVESTIGATION OF THE ORIGINS OF THE ODORS, THE DAMAGE BEING CAUSED, AND THE REACTIONS AND ATTITUDES OF THE LOCAL RESIDENTS. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):48-58, 1967. Translated from Japanese. 8p.

Out of 1586 cases of complaints and petitions concerning public hazards received by the Hokkaido local government in 1965, those related to offensive odors accounted for 25.6%. An investigation of the situation was conducted. The sources of odor included marine products processing plants, animal stockyards, paper manufacturing factories, garbage and trash disposal facilities, agricultural products processing plants, and animal carcass disposal facilities. An investigation of odor diffusion was conducted at 23 different offensive odor sites. Twenty-four measuring points were set up on concentric circles of radius 500, 200, 100, and 50 m, with the plant being the center. The measurements were made with the sense of smell. At distances of more than 100 m, the number of appraisals of 'no odor' was greatest, then 'faint odor', 'definite odor', 'very strong odor', and 'unbearable odor', in that order. Occurrence rates of 'definite odor' were highest downwind of the source, and the odor extended to a greater distance. Questionnaires were

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distributed to residents of the area, and inquiries were made concerning their reactions and attitudes toward the odor. A total of 70.9% of all the people interviewed appraised the odor to be 'definite odor' or greater.

8445 APTIC NUMBER 19191

Syoji, Hikaru
SOME ASPECTS OF THE ENVIRONMENTAL POLLUTION CONTROL PROBLEM AT THE INTERNATIONAL SOCIAL SCIENCES SYMPOSIUM. (Kankyoseigyo no wenkara mita kogaimondai kokusai shinpojumu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):429-432, June 15, 1970. 2 refs.

Engineering in environmental pollution control has established methodologies because it is a newly opened field created in response to environmental disruption. Two questions are presented to a theory which points to the necessity of transforming expressions used by social sciences to those used by natural science. People are too diverse to simply be measured by methods employed by natural sciences; there is a limit to the terminologies that could serve for the transformation, even if social affairs could be measured by some of them. In addition, there are no guides or empirical studies for use in putting the theory into practice. Because the specific phenomena of environmental pollution is on a boundary between two disciplines, it would be extremely difficult to combine the achievements of social sciences with those of natural sciences. Despite the importance of engineering to environmental pollution control, it is contingent on the recognition of environmental pollution as a social phenomena.

8446 APTIC NUMBER 19190

Ui, J., Kyoichi Sonoda, and Nobuko Iijima
PROGRESS OF 'KOGAI' CONTROL AND PUBLIC OPINION. (PART III). (Kogaitaisaku no Keisei to Seron. (Sono III)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(6):409-417, June 15, 1970.

Nearly 10 yrs ago, many persons died in Minamata as the result of eating fish poisoned by mercury discharges from a chemical plant. The deaths were unique and unprecedented, but six years passed before mercury was identified as the toxic agent. In the course of tracing the source of the mercury, investigators were hampered by various objections and political pressures designed to withhold information from the public. As a result, public opinion became quiescent until a similar case of mercury poisoning occurred at Niigata. That the poisoning was repeated is viewed as characteristic of the Japanese attitude about public opinion and of the extrere aggravation of industrial pollution, which the social system appears incapable of controlling. The two mercury poisoning episodes symbolize the conflicts between industry and local communities, capital and science, the right of local governments and central bureaucratic power, society and power holders and also the obstacles to research.

8447 APTIC NUMBER -----

American Inst. of Plant LUTION

APTIC NUMBER 19641

American Inst. of Plant Engineers, Cincinnati, Ohio
A PLANT ENGINEER'S GUIDE TO THE LITERATURE ON AIR AND WATER POLLUTION. 47p., 1970. 603 refs. (C. Fred Gurnham, ed.)

This survey of the literature of air and water pollution is intended for the practicing plant engineer. It emphasizes technical materials, while also indicating some of general interest. Legislation and economics are briefly mentioned. References are arranged by types of publications (bibliographies, periodicals, conferences and symposia, monographs, and miscellaneous reports) to facilitate use of the Guide. The bulk of sources span the 1960's through 1968 and into 1969, with most others in the late 1950's and a few earlier items of historical significance or lasting interest. In general, only English-language publications are included, but there are a few exceptions. A list of agencies and organizations active and publishing in air and water pollution is presented in the last chapter. (Author introduction modified)

8448 APTIC NUMBER 19535

Interamerican Association of Sanitary Engineers
TWELFTH INTERNATIONAL CONGRESS OF SANITARY ENGINEERS, 23 TO 29 AUGUST, 1970, CARACAS, VENEZUELA, INFORMATION PAMPHLET. (XII Congreso interamericano ingenieria sanitaria, 23 al 29 de agosto, 1970. Caracas, Venezuela. Folleto Informativo). 12p., 1970. Translated from Spanish. Belov and Associates, Denver, Colo., 11p., Jan. 29, 1970.

A call for papers to the 12th International Congress of Sanitary Engineers provides the directions for the preparation of the papers for submittal, the subject matters which will be considered by the Organizing Committee, schedule for the submittal of papers, and a tentative schedule of events for the conference. The third plenary session will address itself exclusively to pollution and pollutants while the fourth will include consideration of these topics with relation to legislation, both existing and recommended. The first two sessions are scheduled to consider the contribution of sanitary engineering to the orderly growth of cities, remodeling of slum suburbs, and consumption and its control.

8449 APTIC NUMBER 21654

Cerovsky, J.
QUESTIONS OF THE POLLUTION OF THE NATURAL ENVIRONMENT AT THE INTERGOVERNMENTAL CONFERENCE ON THE BIOSPHERE. (Otazky znecistovani prirodniho prostredi na mezivladni konferenci o biosfere). Ochrana Ovzdusi, vol. 1, Jan. 1969. Translated from Czech. Belov and Associates, Denver, Colo., 12p., April 20, 1970.

Among the main themes of the 1968 Intergovernmental Conference on the Biosphere was the pollution of the living environment. Reports submitted to the conference noted the obvious connection between water, air, and soil pollution and the damaging effects of pollution on man and vegetation. Both air and water pollution were the result of increased utilization of fossil fuels, increased production of organic chemicals, urbanization, and the rapid rise in motor vehicles in the past decade. Since the beginning of the sixties, the sulfur dioxide and carbon monoxide content of air has been increasing, while the pH of atmospheric precipitation has been decreasing. The damaging effects of carbon monoxide on the central nervous system and on blood circulation have been established, as has the relationship between atmospheric pollution and chronic bronchitis. Since industrial production in industrialized countries will roughly double within the next 20 years, preventive measures are imperative to save the living environment. Technology as it exists today must be intensively applied, and research and development must be intensified. Also of extreme importance is the cooperation of the medical and biological sciences in the clarification of the mutual relations and mechanisms of the action of noxious materials. International organizations should decide which organic materials should be the primary object of research and control. In addition, methods of unified control should be studied as a means of achieving world control of the atmosphere, soil, water, and organisms.

8450 APTIC NUMBER 19381

Faith, W. L.
AIR POLLUTION REVIEW 1958-59. Ind. Eng. Chem., 52(11): 967-971, Nov. 1960. 226 refs.

A review of the air pollution literature published in 1958 and 1959 is presented. The nature of the air pollution problem in many areas was assessed and reported in general articles and in survey reports. Special reports on the protein content of the atmosphere, organic particulates, and metals in particulates were also published. The air pollution regulations in the United States and Great Britain have been critically reviewed. The California State Department of Public Health developed and published standards for the allowable concentrations of sulfur dioxide, carbon monoxide, particulates, and photochemical reactants in the ambient atmosphere. Atmospheric transport of pollutants was studied by observing smoke and radioactive plumes and by theoretical mathematical studies of diffusion. Various lists of the economic, health, and nuisance effects of air pollution have been published. The general air pollution problems of many industries and the control methods they use are presented in tabular form. A general survey of the current practices and costs of abatement was published. Specific reports on controlling automobile exhausts dealt with direct-flame afterburners and catalytic oxidation systems. Proper maintenance

and carburetor adjustment were proposed as partial control methods. Systems for controlling organic vapors by catalytic combustion, smokeless flaring, and adsorption were described.

8451 APTIC NUMBER 19179

Gilbert, T.
THE PRACTICAL APPLICATION OF THE DISPERSION CALCULATION. (Ueber die Anwendung der Ausbreitungsrechnung in der Praxis). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:163-168, 1970. 4 refs.

The calculation of the stack height requires corrections when the following prerequisites are not or only partially fulfilled: the emitted pollutants must be gaseous, it may not be physically or chemically changed during dispersion, and it must be emitted continuously, i.e., the quantity of pollutants and of the entire stack gas as well as the waste gas temperature must be temporarily constant. Moreover, the vicinity of the emission source must be flat and may not have any high rising vegetation or buildings. For determining the stack height of an emission source in hilly terrain, the theoretical studies by Stueske are practical; a potential flow in a two dimensional field is used and the change caused by the terrain is studied. The corrected stack height is obtained from the difference of the corrected effective source height and the corrected momentum rise and buoyancy rise. Other important parameters are the distance of the hill, the slope, and the height of the hill. If the wind flow is disturbed by an obstacle (buildings, trees, etc.), practical experience has shown that it suffices to let the stack end 1 m above the top of the obstacle. If the emission source is in a residential area and the stack is higher than 10 times the average height of the surrounding homes, no correction is necessary. If the stack is lower than 4 times the average height of the homes, the average height of the homes is added to the stack height to obtain the corrected stack height.

8452 APTIC NUMBER 19350

Hershaft, A.
AIR POLLUTION CONTROL: A CRITICAL OVERVIEW. Grumman Aircraft Engineering Corp., Bethpage, N. Y., Research Dept., RM-446, 28p., June 1969. 20 refs.

A discussion of the nature, effects, and measurement of air pollutants is followed by an examination of discharge and control problems; subsequent sections deal with control legislation and programs, and the most pressing technical problems in each of the areas mentioned. A convincing link has been established between chronic exposure to sulfur dioxide levels prevalent in major population centers and the incidence of emphysema, bronchitis, and lung cancer. Carbon monoxide and nitrogen oxides interfere with proper distribution of oxygen to the body by forming an addition complex with hemoglobin; eye and throat irritation, commonly associated with smog, are caused by the formaldehyde and ozone produced by reactions between nitrogen oxide, oxygen, and hydrocarbons under the influence of the sun's ultraviolet radiation. Plant life is damaged, as well as the surfaces of buildings, automobiles, clothing, and other exposed objects, and the thermal balance of the atmosphere is altered. Modification of the gasoline engine and associated equipment is currently receiving attention in the areas of positive crankcase ventilation, air injection, improvement of combustion efficiency, employment of oxidizers, and curtailment of evaporation. Incomplete combustion and other chemical reactions, industrial evaporation, and attrition processes contribute about 40% of the total burden of man-produced air pollution. Control methods are aimed at curtailment of sulfur dioxide emission by gravity, magnetic, gaseous, and bacterial separation, and other particulates with mechanical collectors, fabric filters, wet scrubbers, and electrostatic precipitators. Air pollution measurements fall into one category which deals with measurement of emission levels and another which deals with pollutant concentration in the ambient air. Control legislation requires the establishment of air quality criteria, air quality standards, air quality regions, and emission controls. The annual federal outlay required to achieve a 60-75% reduction in air pollution is estimated at about $750 million, while the actual expenditure of $68.2 million for the 1968 federal year was less than one tenth of that amount.

8453 APTIC NUMBER 19382

Kay, Kingsley
AIR POLLUTION REVIEW 1956-57. Ind. Eng. Chem., 50(8): 1175-1180, Aug. 1958. 261 refs.

A bibliography on various aspects of air pollution and methods of control is presented. Articles are included on the dust, sulfur dioxide, ozone, nitrogen oxides, carbon monoxide, organic vapors, bacterial aerosol, and insecticide pollution in the United States and Great Britain. An annotated bibliography on radioactive fallout is also included. Pollution from engine exhausts and the meteorological conditions involved in air pollution are discussed. The legislative and regulatory controls in the United States and Great Britain are reviewed in several of the references. The fundamental dynamics of atmospheric diffusion and turbulence have been treated mathematically along with plume behavior. Cyclones, wet scrubbers, electrostatic precipitators, and filters have been studied by many authors. The control of odors and the catalytic treatment of effluents are also included. Pollution control in specific industrial sources such as atomic installations, furnaces, fertilizer plants, rendering plants, digesters, and incinerators have also been investigated.

8454 APTIC NUMBER 21727

Kittner, Z.
THE FIGHT AGAINST AIR POLLUTION IN WEST GERMANY. Ochrana Ovzdusi, vol. 1. Sept. 1969. Translated from Czech. Belov and Associates, Denver, Colo., 9p., April 18, 1970.

In West Germany, about 2 million tons of ash, 4 million tons of sulfur dioxide, and about 6 million tons of carbon monoxide are emitted annually. Their sources include cement plants, power

plants, and the chemical industry: motor vehicles; and home heating plants. The influence of topographical and weather conditions on pollutant concentrations is reviewed, as well as the effects of pollutants on man, animals, and vegetation. Human lungs are particularly sensitive to attack from small dust particles, but pollution can also cause skin and eye damage. Plants are even more sensitive to pollution than man. Particularly dangerous gases like carbon monoxide, sulfur dioxide, and fluoride are not visible in the air. The danger of carbon monoxide rests in the fact that it can replace the oxygen in blood pigmentation. Sulfur dioxide can hinder breathing and cause heavy damage to plants, particularly forest plants. To combat pollution, the Federal Government is supporting research in many fields, particularly medicine, agronomy, meteorology, chemistry, physics, mathematics, and facility design. It is noted that because the concentration of pollutants in the atmosphere is frequently very low, complex methods and equipment must be developed to capture and measure them.

8455 APTIC NUMBER 19526

Lloyd, G. A.
THE PETROLEUM INDUSTRIES' AIR POLLUTION CONTROL PROGRAM. J. Air Pollution Control Assoc., 11(1):6-8, 44, Jan. 1961. (Presented at the Air Pollution Control Association Annual Meeting, 53rd, Cincinnati, Ohio, May 22-26, 1960.)

A brief history of the air pollution problem is provided with a pair of interesting observations on the subject made in 1542 and 1834, both in the Los Angeles basin. The history and activities of the Smoke and Fumes Committee of the American Petroleum Institute (API) is related and a list of significant projects and contributions of the API is related and a list of significant projects and contributions of the API is presented. One of the more interesting of these was the identification of peroxy acyl nitrite, first as a harmless intermediate product of smog reaction and then as a potent cause of both plant damage and eye irritation. Other contributions listed include a technique for tracing the path of material discharged from a single source as an incinerator or smokestack, which takes into account the weather conditions affecting such a path, a study of meteorological phenomena as they affect air sampling, contributions to methods for analyzing the many hydrocarbon compounds in automotive exhausts, and a study showing that domestic and industrial furnaces burning gas or oil discharge very minor quantities of hydrocarbons, even under poor operating conditions. The structure, history, and purpose of the Information Committee of the API is outlined. Its purpose is declared to be the distribution of information within the petroleum industry, technical circles, and to the general public concerning air pollution problems and activities of individuals and groups seeking to achieve objectives in this field.

8456 APTIC NUMBER 19230

Lohs, Karlheinz
POISONS AND THE ENVIRONMENT. (Gifte und Umwelt). Text in German. Z. Chem., 10(3):81-87, March 1970. 55 refs.

Emissions of industrial and domestic origin, as well as vehicular emissions, have lead to widespread air pollution, the consequences of which cannot yet fully be evaluated. In 1968, more than 2 billion tons of mineral oil were consumed throughout the world, 98% of which was emitted to the atmosphere as combustion products. In view of this, it is quite understandable that the atmospheric carbon dioxide concentration rose 12% since the turn of the century. It is expected that by the end of this century it will have increased by another 10%. The climatic changes this will cause cannot be foreseen. Much has been written about the effects on humans and plants. The rate of lung cancer caused by pollutants such as asbestos, arsenic, chromates, etc. assumes a low percentage in the total number of lung cancer cases. Polycyclic hydrocarbons, primarily benzopyrene, are considered important carcinogens. Water pollution, the use of poisons, e.g., rat poison, polishes, spot removers, etc., in households and in food for preservation are discussed, as is the use of poisons for warfare.

8457 APTIC NUMBER 19060

Lukacs, J. and A. T. Rossano
AIR POLLUTION AND ITS CONTROL. J. Can. Petrol. Technol. (Montreal), 6(1):23-26, Jan.-March 1967. 5 refs. (Presented at The Petroleum Society of CIM Annual Technical Meeting, 17th, Edmonton, May 1966.)

The sources, effects, and meteorological conditions of air pollution are discussed. There are many sources of pollution, including natural and man-made ones. The man-made sources, such as combustion, steel mills, refineries, pulp and paper manufacturing, and food processing generally outweigh the natural sources in number and importance. Man emits dusts, fumes, smoke, soot, flyash, sprays, and mists to the atmosphere in large quantities. The severity of air pollution in a given area is determined largely by the meteorological conditions. The most undesireable meteorological condition is an inversion layer. Inversions lead to poor dilution and dispersion of plumes, and pollutants tend to concentrate in the atmosphere. The effects of pollution vary widely: smoke can reduce visibility; hydrogen sulfide and mercaptans have very objectionable odors; soiling and corrosion of materials result; and plants and animals may be severely injured or killed. There is medical evidence that air pollution is related to emphysema, chronic bronchitis, and lung cancer. It is recommended that new methods be developed to produce by-products from potential contaminants, rather than building higher stacks. Consideration is given to air pollution in Alberta, and an air quality control program is proposed.

8458 APTIC NUMBER 21981

National Air Pollution Control Administration, Raleigh, N. C., Office of Research Grants
HIGHLIGHTS OF SELECTED AIR POLLUTION RESEARCH GRANTS. Pub. AP-70, 58p., May 1970.
CFSTI: PB 191273

The National Air Pollution Control Administration is concerned with all aspects of research and development in the causes, effects, extent, prevention, and control of air pollution as it affects health, welfare, and productivity. The research grant program covers eight major areas: human health effects, agricultural effects, socioeconomic and political studies, analyses and physiochemical investigations, development of analytic methods and equipment, meteorology, air pollution source control, and communications. Research in these and closely related areas increases understanding of the fundamental nature and the complexity of the air pollution problem. Some of the recent accomplishments of the research grant program are presented. It is not a comprehensive account of all projects, but it does present highlights of selected, representative studies. Future publications will include other projects as well as additional results of continuing projects. These highlights are meant to improve communications among investigators and to provide information to the interested public. Individuals interested in the results of specific research are encouraged to communicate directly with the investigator. (Author introduction modified)

8459 APTIC NUMBER 19821

aschewski, L.
EXPERIENCES WITH AIR CONSERVATION IN HUNGARY. (Erfahrungen in Ungarn auf dem Gebiet Reinhaltung der Luft). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 149:376-382, 1970.

state of air pollution control in Hungary is presented. Hungary possesses unusually good resources of scientific and professional personnel dedicated to the campaign against air pollution, but is weak with respect to legislative measures. For example, while adequate provisions are made to protect workers in an industry from occupational exposure, regulations are lax with regard to emissions of pollutants into the environment. There are no official standards for dust emissions or for monitoring of the atmosphere, although foreign standards such as those of the VDI have entered into the planning of new industrial plants. After World War II, 60% of all labor was engaged in agriculture. This has now shrunk to 12-14%, so that the tendency has been to expand industry at any cost, including increased air pollution. The three most popular dust control processes are those employing bag filters composed of heat resistant glass or plastic fibers, dry electrostatic filters, and a combination of scrubbers and electrofilters. An improvement in air quality in the industrial cities has been demonstrated recently, probably due to the development of domestic natural gas sources and increased use of fuel oil.

8460 APTIC NUMBER 19470

Robins, Donald L. and Manlio N. Mattia
COMPUTER PROGRAM HELPS DESIGN STACKS FOR CUTTING AIR POLLUTION. Chem. Eng., vol. 75:119-122, Jan. 29, 1968. 13 refs.

A computer program, written in problem-oriented language for an IBM 1130 computer, is described for analyzing stack dispersion of gases and particulates. The program is based on four equations for effective stack height (Bosanquet-Carey-Halton, Davidson-Bryant, Holland, Bosanquet), one for ground-level concentrations of gases (modified Bosanquet-Pearson) and one for average rate of deposition of particulates (Bosanquet-Carey-Halton). The program's major advantage is the large number of cases it can evaluate; e.g., in computing ground concentration or rate of deposition downwind from a stack for seven locations, 250 cases for gases and 2000 for particulates are studied. Besides application to any type of stack emission problem, it can be helpful in designing relief-venting systems for chemical and petroleum plants and dust-removal equipment to provide closer tolerances. It has two limitations: meteorological parameters are treated only superficially, and the effect of topography on ground-level concentration is completely neglected.

8461 APTIC NUMBER 17735

Sato, Junji and Shin'ichi Sakuraniwa
METEOROLOGICAL CONDITIONS AND SMOKE DIFFUSION. 60. ON THE EVALUATION OF THE EQUATION FOR THE CALCULATION OF THE EFFECTIVE HEIGHT OF A CHIMNEY. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):70-77, 1967. Translated from Japanese. 2p.

The measurement of the effective height of a chimney is conducted by coloring the waste gases with a smoke candle placed in the flue so that the smoke may be observed by a theodolite on the ground. A comparison of the results of the experiments at Omahama with Bosanquet's equation II, Holland's equation, and Priestley's equation showed that Priestley's equation agreed very well with the experimental data. According to this equation, the effective height of a chimney, H, is inversely proportional to the average wind speed, and directly proportional to the 1/4 power of the discharged heat, Q. By investigating the relationship between the average wind speed at a height of 168 m and the observed value of the effective height, it was found that the effective height of a chimney, H, is inversely proportional to the 3/2 power of the average wind speed, u.

8462 APTIC NUMBER 19088

Thuman, William C.
ACTIVITIES OF THE NASA-SPONSORED SRI TECHNOLOGY APPLICATIONS TEAM IN TRANSFERRING AEROSPACE TECHNOLOGY TO THE PUBLIC SECTOR. (QUARTERLY PROGRESS REPORT). Stanford Research Inst., Menlo Park, Calif., Contract NASw-1992, SRI Proj. PAU-8368, Rept. 1, 37p., Oct. 1969.
CFSTI: N70-14913

An interdisciplinary Technology Applications Team was established to plan, coordinate, control, and evaluate a program to apply aerospace data to the solution of public sector user problems in the fields of criminalistics, transportation, and air pollution. Emphasis is placed on users west of the Rocky Mountains. Problems are identified through visits to and consultation with user agencies. Two air pollution control agencies, the Bay Area Air Pollution Control District and the Air and Industrial Hygiene Laboratory of the California Dept. of

Public Health, were visited. The major problem identified was the requirement for relatively inexpensive continuous monitoring instruments for the measurement of opacity and the identification of particle size and composition in photochemical smog, concentration and composition of gaseous emissions, wind speed, temperature, and direction, and odors. Other problems mentioned were the need for a method to remove sub-micron particles from stack effluent and several biomedical problems associated with air pollution.

8463 APTIC NUMBER 21660

VDI (Verein Deutscher Ingenieure) Fachgruppe Staubtechnik, Duesseldorf, Germany, Arbeitsgruppe Begriffsbestimmungen Reinhaltung der Luft
DEFINITIONS OF (GERMAN; TERMS AIR-POLLUTION CONTROL. (Begriffsbestimmungen Reinhaltung der Luft). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2104, Sept. 1966. Translated from German by D. Ben Yaakov, Israel Program for Scientific Translations, Jerusalem, 7p.
CFSTI: TT 68-50469/8

A revised and supplemented third edition presents brief definitions of 62 German terms related to air pollution control; the translation provides approximately equivalent English terms and a translation of the German definition. There are five categories: formation and emissions of dusts, suspended matter, and gases; propagation (dispersion) and precipitation of air pollutants; effects of extraneous substances in air; measuring techniques and special technical problems; and 'general.' An appendix gives conversion factors for air pollution measuring units used in English-speaking countries.

SUBJECT INDEX

The terms listed in this subject index are those that most closely describe the information presented in the abstracts. Instead of the APTIC number, the NAPCA ABSTRACT BULLETIN (NAB) number is used to identify the abstracts. The NAB number is shown in the upper left corner of each abstract. This issue includes NAB numbers 7328 - 8463, which are tabulated below to facilitate use of the index.

Category	NAB Number
Emission Sources	7328 - 7399
Control Methods	7400 - 7767
Measurement Methods	7768 - 7976
Air Quality Measurements	7977 - 8008
Atmospheric Interaction	8009 - 8099
Basic Science and Technology	8100 - 8232
Effects-Human Health	8233 - 8321
Effects-Plants and Livestock	8322 - 8358
Effects-Materials	8359 - 8370
Economic Aspects	8371 - 8390
Standards and Criteria	8391 - 8407
Legal and Administrative	8408 - 8440
Social Aspects	8441 - 8446
General and Miscellaneous	8447 - 8463

Preceding page blank

SUBJECT INDEX

ABSORPTION
7336, 7378, 7414, 7445, 7455, 7456, 7488, 7512, 7513
7518, 7519, 7542, 7544, 7626, 7629, 7635, 7645, 7653
7669, 7673, 7676, 7689, 7691, 7703, 7715, 7721, 7723
7761, 7773, 7786, 7816, 7862, 7882, 7885, 7905, 7918
7952, 8014, 8C5C, 8059, 8121, 8122, 8150, 8158, 8186
8188, 8230, 8349, 8354, 8356, 8367,

ADSORPTION
7364, 7422, 7456, 7488, 7557, 7571, 7574, 7587, 7596
7663, 7673, 7677, 7691, 7693, 7708, 7715, 7753, 7803
7836, 7846, 7974, 8117, 8123, 8140, 8148, 8164, 8219
8228,

AEROSOL GENERATORS
7397, 7553, 8018, 8124, 8153, 8194, 8215, 8224,

AFRICA
7988, 8240,

AFTERBURNERS
7338, 7358, 7365, 7392, 7409, 7446, 7499, 7508, 7596
7597, 7708, 8385, 8427,

AIR QUALITY CRITERIA
7991, 8316, 8419, 8440,

AIR QUALITY MEASUREMENTS
SEE ALSO: DUST FALL, EMISSION INVENTORIES, AND VISIBILITY
7336, 7343, 7356, 7365, 7374, 7389, 7396, 7403, 7777
7785, 7795, 7809, 7839, 7841, 7864, 7901, 7903, 7936
7951, 7963, 7977, 7978, 7979, 7980, 7981, 7982, 7983
7984, 7985, 7987, 7989, 799C, 7992, 7995, 7996, 7998
7999, 800C, 8C01, 8002, 8C03, 8004, 8005, 8006, 8007
8008, 8025, 8032, 8042, 8049, 8052, 8055, 8064, 8072
8073, 8095, 8247, 8248, 8251, 8271, 8313, 8359, 8410
8415, 8416, 8419, 8420,

AIR QUALITY STANDARDS
SEE ALSO: MAXIMUM ALLOWABLE CONCENTRATION
7544, 7948, 7991, 8316, 8394, 8404, 8406, 8413, 8425
8440,

AIR RESOURCE MANAGEMENT
8412, 8424, 8429, 8431, 8432, 8452,

AIRCRAFT
SEE ALSO: GAS TURBINES
7344, 7547, 7668, 7753, 7832, 7963, 8020, 8051, 8075
81CC, 8124, 8243, 8398, 8457,

ALDEHYDES
7390, 7396, 7485, 7499, 7691, 7777, 7847, 7856, 7881
7918, 7946, 7992, 8008, 801C, 8050, 8054, 8101, 8213
8344, 8452,

ALIPHATIC HYDROCARBONS
SEE ALSO: ETHYLENE AND METHANES
7341, 7358, 7367, 7368, 7399, 7485, 7627, 7844, 7871

ALIPHATIC HYDROCARBONS (Cont'd)
7918, 7924, 7961, 8010, 8035, 8076, 8086, 8094, 8102
8110, 8118, 8141, 8142, 8147, 8150, 8152, 8155, 8188
8190, 8206, 8210, 8211, 8213, 8275,

AMMONIUM COMPOUNDS
7343, 7347, 7351, 7365, 7436, 7441, 7443, 7455, 7459
7460, 7498, 7507, 7512, 7564, 7565, 7566, 7584, 7586
7593, 7604, 7605, 7645, 7652, 7656, 7693, 7699, 7700
7704, 7720, 7735, 7818, 7847, 7882, 7885, 7886, 7887
7896, 7924, 7930, 7952, 7969, 7995, 8005, 8091, 8121
8122, 8196, 8398,

AREA SURVEYS
7382, 7795, 7977, 7985, 7994, 8004, 8019, 8063, 8253
8267, 8357,

AROMATIC HYDROCARBONS
7350, 7440, 7442, 7844, 7868, 7871, 7918, 7933, 7959
7961, 7989, 8010, 8176, 8186, 8248, 8319,

ARSENIC COMPOUNDS
7989, 8242,

ASBESTOS
7394, 7520, 7751, 8249,

ASIA
7343, 7347, 7351, 7353, 7354, 7358, 7360, 7361, 7363
7365, 7374, 7375, 7381, 7382, 7383, 7385, 7387, 7396
7426, 7470, 7487, 7488, 7511, 7527, 7535, 7537, 7543
7544, 7552, 7553, 7554, 7556, 7557, 7573, 7574, 7576
7577, 7583, 7584, 7590, 7591, 7620, 7628, 7629, 7639
7640, 7642, 7643, 7646, 7650, 7652, 7653, 7689, 7692
7700, 7714, 7717, 7718, 7719, 7720, 7721, 7727, 7728
7729, 7760, 7761, 7762, 7764, 7802, 7822, 7825, 7826
7827, 7835, 7841, 7846, 7847, 7848, 7849, 7850, 7853
7868, 7869, 7879, 7884, 7885, 7886, 7887, 7888, 7890
7896, 7897, 7898, 7899, 7900, 7901, 7902, 7909, 7919
7922, 7930, 7932, 7940, 7941, 7942, 7943, 7944, 7951
7952, 7953, 7954, 7962, 7974, 7975, 7981, 7984, 7992
7995, 7996, 8003, 8008, 8023, 8036, 8037, 8038, 8039
8041, 8042, 8043, 8063, 8064, 8068, 8069, 8078, 8079
8080, 8082, 8085, 8086, 8087, 8088, 8089, 8092, 8096
8097, 8100, 8123, 8161, 8164, 8187, 8194, 8212, 8219
8231, 8253, 8260, 8264, 8265, 8266, 8267, 8268, 8270
8278, 8289, 8299, 8300, 8308, 8309, 8313, 8317, 8318
8319, 832C, 8321, 8337, 8339, 8340, 8358, 8368, 8369
8380, 8381, 8395, 8397, 8398, 8399, 8401, 8406, 8407
8414, 8415, 8431, 8436, 8442, 8443, 8444, 8445, 8446
8461,

ATMOSPHERIC MOVEMENTS
7344, 7353, 7366, 7373, 7431, 7663, 7793, 7851, 7854
7890, 7903, 7912, 7913, 7971, 7977, 7980, 7981, 7984
7994, 8006, 8007, 8013, 8015, 8018, 8020, 8023, 8024
8026, 8027, 8029, 8030, 8031, 8032, 8036, 8037, 8039
8041, 8042, 8043, 8045, 8048, 8056, 8057, 8058, 8060
8064, 8066, 8082, 8083, 8084, 8089, 8096, 8099, 8149
8198, 8247, 8269, 8311, 8315, 8339, 8451, 8461, 8462

AUTOMOTIVE EMISSION CONTROL
SEE ALSO: AUTOMOTIVE EMISSIONS
7341, 7350, 7358, 7375, 7386, 7396, 7402, 7446, 7468
7469, 7475, 7480, 7484, 7485, 7497, 7513, 7555, 7571
7595, 7597, 7599, 7614, 7618, 7619, 7624, 7636, 7638
7640, 7641, 7642, 7649, 7688, 7708, 7717, 7741, 7745
7960, 8392, 8397, 8409, 8434, 8452,

AUTOMOTIVE EMISSIONS
SEE ALSO: AUTOMOTIVE EMISSION CONTROL
7341, 7344, 7349, 7350, 7352, 7353, 7354, 7355, 7356
7358, 7362, 7367, 7370, 7381, 7382, 7390, 7393, 7396
7399, 7402, 7430, 7440, 7446, 7468, 7469, 7475, 7480
7484, 7485, 7488, 7513, 7531, 7555, 7571, 7595, 7596
7597, 7599, 7614, 7618, 7624, 7635, 7638, 7640, 7641
7642, 7668, 7692, 7708, 7711, 7717, 7741, 7745, 7793
7806, 7822, 7828, 7836, 7843, 7871, 7951, 7960, 7973
7979, 7981, 7986, 7987, 7992, 7999, 8081, 8088, 8097
8270, 8302, 8318, 8355, 8392, 8396, 8398, 8409, 8419
8421, 8436, 8455, 8457,

BARIUM COMPOUNDS
7970, 8176,

BENZOPYRENES
7342, 7393, 7396, 7868, 7904, 7929, 7975, 8139, 8256
8259, 8286, 8310, 8456,

BERYLLIUM COMPOUNDS
8246, 8251, 8357,

BOILERS
7357, 7361, 7363, 7413, 7562, 7594, 7604, 7616, 7620
7639, 7697, 7707, 7710, 7711, 7721, 7726, 7727, 7750
7757,

BORON COMPOUNDS
8190, 8345,

BRONCHITIS
7336, 8236, 8237, 8243, 8253, 8260, 8267, 8270, 8273
8290, 8297, 8304, 8314, 8315, 8316, 8320, 8449, 8452

BY-PRODUCT RECOVERY
7391, 7398, 7405, 7415, 7416, 7417, 7419, 7422, 7426
7428, 7429, 7442, 7453, 7455, 7458, 7492, 7496, 7505
7507, 7509, 7512, 7517, 7525, 7536, 7541, 7548, 7565
7566, 7568, 7579, 7586, 7588, 7604, 7605, 7606, 7608
7609, 7611, 7625, 7628, 7643, 7652, 7654, 7656, 7661
7669, 7676, 7678, 7680, 7683, 7684, 7685, 7697, 7702
7705, 7716, 7720, 7723, 7726, 7732, 7733, 7734, 7738
7739, 7744, 7746, 7755, 7756, 7757, 7760, 7766, 8382
8457,

CADMIUM COMPOUNDS
7336, 8238, 8336,

CALIBRATION METHODS
7787, 7794, 7798, 7805, 7808, 7812, 7823, 7824, 7831
7836, 7853, 7855, 7860, 7864, 7876, 7877, 7908, 7914

CALIBRATION METHODS (Cont'd)
7915, 7924, 7925, 7931, 7935, 7948, 7958, 8153, 8209
8463,

CANCER
7337, 7394, 7399, 8242, 8249, 8256, 8278, 8302, 8452
8456,

CARBON MONOXIDE
7333, 7349, 7353, 7356, 7358, 7367, 7375, 7381, 7382
7396, 7430, 7446, 7467, 7468, 7484, 7485, 7488, 7497
7459, 7513, 7519, 7552, 7555, 7596, 7607, 7610, 7612
7614, 7618, 7619, 7621, 7630, 7635, 7638, 7640, 7641
7642, 7674, 7677, 7688, 7691, 7704, 7708, 7731, 7740
7769, 7794, 7811, 7812, 7814, 7817, 7864, 7865, 7872
7873, 7884, 7890, 7894, 7903, 7916, 7918, 7936, 7960
7979, 7981, 7992, 7998, 8008, 8057, 8094, 8101, 8107
8110, 8112, 8115, 8129, 8137, 8158, 8163, 8164, 8177
8178, 8184, 8187, 8192, 8195, 8201, 8207, 8213, 8219
8229, 8230, 8237, 8239, 8250, 8251, 8252, 8254, 8255
8258, 8263, 8274, 8279, 8280, 8282, 8287, 8291, 8292
8296, 8303, 8306, 8308, 8311, 8328, 8371, 8392, 8396
8397, 8398, 8427, 8449, 8452, 8454, 8457,

CARCINOGENS
7399, 7868, 7975, 8004, 8139, 8248, 8256, 8259, 8302
8310, 8456,

CATALYSIS
SEE ALSO: CATALYTIC OXIDATION
7375, 7404, 7419, 7422, 7423, 7427, 7428, 7429, 7437
7442, 7451, 7475, 7502, 7504, 7505, 7515, 7519, 7525
7527, 7535, 7562, 7609, 7610, 7611, 7612, 7613, 7621
7625, 7634, 7640, 7648, 7673, 7697, 7698, 7718, 7726
7738, 7743, 7744, 7865, 7936, 8014, 8047, 8091, 8108
8129, 8135, 8137, 8152, 8161, 8164, 8172, 8178, 8190
8191, 8195, 8199, 8204, 8219, 8228, 8364,

CATALYTIC OXICATION
SEE ALSO: CATALYSIS
7357, 7364, 7378, 7409, 7417, 7429, 7430, 7447, 7475
7481, 7502, 7508, 7513, 7519, 7525, 7531, 7535, 7541
7584, 7596, 7597, 7619, 7625, 7640, 7664, 7697, 7705
7708, 7710, 7760, 7763, 7766, 7786, 8014, 8047, 8104
8172, 8195, 8201, 8373, 8382,

CENTRIFUGAL SEPARATORS
7339, 7346, 7400, 7406, 7435, 7438, 7450, 7465, 7494
7498, 7503, 7522, 7555, 7575, 7584, 7585, 7615, 7633
7637, 7646, 7686, 7689, 7691, 7760, 7792, 7813, 7840
8119, 8385,

CHEMICAL REACTIONS
SEE ALSO: PHOTOCHEMICAL REACTIONS
7348, 7356, 7357, 7359, 7378, 7405, 7415, 7417, 7418
7419, 7420, 7427, 7428, 7437, 7441, 7449, 7451, 7463
7504, 7505, 7509, 7511, 7524, 7527, 7530, 7548, 7555
7565, 7568, 7570, 7592, 7598, 7605, 7606, 7607, 7608
7609, 7610, 7612, 7613, 7621, 7634, 7648, 7653, 7661
7676, 7683, 7684, 7695, 7704, 7706, 7726, 7731, 7732
7735, 7742, 7743, 7744, 7746, 7747, 7755, 7865, 7870
7875, 7945, 7955, 7956, 7960, 7970, 8027, 8049, 8050

CHEMICAL REACTIONS (Cont'd)
8054, 8061, 8067, 8091, 8094, 8101, 8107, 8108, 8111
8112, 8113, 8115, 8123, 8127, 8128, 8129, 8134, 8137
8139, 8141, 8144, 8145, 8146, 8147, 8148, 8151, 8152
8154, 8157, 8158, 8161, 8162, 8163, 8168, 8174, 8178
8180, 8182, 8190, 8191, 8193, 8195, 8199, 8200, 8203
8204, 8205, 8207, 8211, 8214, 8217, 8225, 8226, 8228
8243, 8252, 8284, 8285, 8289, 8296, 8335, 8356, 8363
8369,

CHILDREN
8235, 8265, 8290, 8300, 8301, 8307,

CHLORINE COMPOUNDS
SEE ALSO: HYDROCHLORIC ACID AND HALOGENATED HYDROCARBONS
7388, 7517, 7785, 7941, 7952, 7995, 8108, 8177, 8339
8363, 8398, 8413,

CHROMIUM COMPOUNDS
7394, 7785, 7838, 8095, 8164, 8172, 8178,

CIRCULATORY SYSTEM
8250, 8271, 8274, 8291, 83C6,

COAL
7357, 7359, 7378, 7398, 7417, 7427, 7453, 7464, 7477
7521, 7530, 7534, 7541, 7592, 7594, 7603, 7612, 7617
7635, 7660, 7664, 7678, 77C4, 7705, 7712, 7713, 7731
7758, 7855, 7987, 8060, 8234, 8304, 8322, 8324, 8388
8391, 8413,

COLORIMETRY
7336, 7337, 7389, 7390, 763C, 7691, 7783, 7794, 7795
7812, 7820, 7834, 7835, 7867, 7879, 7881, 7908, 7925
7937, 7941, 7950, 7955, 7956, 7970, 7992, 8097, 8154
8187, 8234, 8312,

COLUMN CHROMATOGRAPHY
7796, 7811, 7923, 8159,

COMBUSTION PRODUCTS
7335, 7343, 7347, 7349, 7356, 7357, 7365, 7369, 7370
7378, 7382, 7386, 7391, 7398, 7399, 7405, 7413, 7415
7417, 7418, 7419, 7420, 7421, 7426, 7428, 7429, 7432
7435, 7436, 7441, 7443, 7447, 7448, 7449, 7451, 7452
7459, 7463, 7471, 7473, 7475, 7481, 7488, 7490, 7492
7496, 7498, 7504, 7505, 7507, 7509, 7511, 7512, 7517
7521, 7527, 7530, 7533, 7534, 7536, 7539, 7541, 7559
7562, 7563, 7564, 7565, 7566, 7567, 7568, 7569, 7570
7572, 7573, 7574, 7577, 7579, 7581, 7584, 7586, 7588
7592, 7593, 7594, 7604, 7606, 7607, 7608, 7609, 7610
7611, 7612, 7613, 7616, 7620, 7624, 7625, 7629, 7631
7635, 7636, 7644, 7646, 7648, 7650, 7654, 7655, 7656
7658, 7659, 7661, 7662, 7664, 7666, 7680, 7681, 7683
7684, 7685, 7697, 7702, 7703, 7705, 7706, 7710, 7712
7720, 7726, 7727, 7728, 7729, 7732, 7733, 7734, 7738
7739, 7743, 7744, 7746, 7747, 7755, 7757, 7760, 7762
7763, 7766, 7767, 7768, 7771, 7795, 7817, 7839, 7841
7842, 7846, 7860, 7873, 7888, 7914, 7922, 7929, 7946
7958, 7962, 7989, 8011, 8014, 8038, 8039, 8043, 8045
806C, 8078, 8084, 8087, 8089, 8093, 812C, 8179, 8234
8348, 8382, 8391, 8399, 8413, 8414, 8440, 8455, 8456

COMBUSTION PRODUCTS (Cont'd)
8457, 8460, 8462,

CONDENSATION (ATMOSPHERIC)
7824, 7829, 7997, 8009, 8034, 8041, 8047, 8053, 8055
8073, 8081, 8085, 8463,

CONSTRUCTION MATERIALS
7340, 7394, 7410, 7439, 7476, 7480, 7482, 7483, 7495
7514, 7515, 7528, 7611, 7628, 8003, 8228, 8350, 8365
8366,

CONTROL AGENCIES
8375, 8412, 8413, 8416, 8419, 8420, 8426, 8427, 8429
8432, 8433, 8439, 8440, 8447, 8459,

CONTROL PROGRAMS
7464, 7678, 7890, 7943, 8316, 8394, 8413, 8416, 8419
8425, 8427,

CONTROLLED ATMOSPHERES
7379, 7488, 7542, 7691, 7882, 7918, 7950, 7961, 7968
8170,

COPPER COMPOUNDS
7562, 7838, 7853, 7963, 8003, 8095, 8164, 8190, 8219
8271,

CORROSION
7337, 7357, 7365, 7639, 7652, 7697, 8234, 8359, 8361
8362, 8363, 8368, 8369, 837C,

COSTS
7335, 7354, 7384, 7408, 7433, 7454, 7466, 7474, 7477
7483, 7487, 7507, 7522, 7527, 7534, 7538, 7539, 7546
7550, 7616, 7660, 7664, 7702, 7705, 7710, 7767, 7768
7830, 7839, 7931, 8371, 8372, 8373, 8374, 8375, 8376
8377, 8378, 8379, 8380, 8382, 8383, 8384, 8385, 8386
8388, 8389, 8390, 8417, 8421, 8441, 8442, 8452,

CROPS
7793, 8247, 8272, 8313, 8325, 8332, 8333, 8335, 8343
8344, 8346, 8349, 8350, 8351, 8352, 8390, 8440,

DATA HANDLING SYSTEMS
737C, 7655, 7781, 7804, 7823, 7837, 7839, 7864, 7890
7903, 7939, 7964, 7993, 8026, 8094, 8167, 8198, 8362
8460,

DESIGN CRITERIA
7397, 7405, 7410, 7411, 7412, 7419, 7421, 7430, 7431
7434, 7435, 7438, 7443, 7445, 7449, 7450, 7451, 7452
7461, 7465, 7467, 7469, 7471, 7476, 7477, 7480, 7482
7486, 7489, 7494, 7495, 75CC, 7501, 7504, 7510, 7513
7514, 7522, 7528, 7531, 7532, 7533, 7540, 7547, 7549
7555, 7560, 7566, 7568, 7569, 7571, 7572, 7574, 7575
7576, 7578, 7580, 7582, 7584, 7589, 7591, 7596, 7597
7599, 7600, 7601, 7602, 7612, 7613, 7615, 7619, 7624
7627, 7629, 7630, 7631, 7632, 7633, 7634, 7636, 7638
7641, 7651, 7655, 7657, 7670, 7671, 7672, 7676, 7679
7682, 7686, 7687, 7689, 7690, 7696, 7701, 7703, 7706
7707, 7710, 7711, 7714, 7717, 7722, 7725, 7726, 7728

DESIGN CRITERIA (Cont'd)
7729, 7740, 7741, 7745, 7747, 7748, 7749, 7750, 7754
7764, 7765, 7773, 7776, 7777, 7787, 7788, 7789, 7790
7792, 7804, 7806, 7808, 7814, 7839, 7840, 7842, 7845
7846, 7848, 7852, 7858, 7860, 7870, 7872, 7878, 7881
7906, 7910, 7911, 7913, 7915, 7918, 7920, 7921, 7923
7926, 7931, 7936, 7942, 7962, 7972, 7973, 7976, 8108
8114, 8119, 8121, 8165, 8200, 8209, 8360, 8362, 8379
8394, 8418, 8423, 8428, 8460,

DESULFURIZATION OF FUELS
7368, 7378, 7404, 7427, 7442, 7487, 7493, 7515, 7521
7527, 7541, 7556, 7598, 7603, 7617, 7618, 7626, 7634
7664, 7666, 7689, 7697, 7698, 7704, 7705, 7712, 7713
7718, 7742, 7753, 7758, 7827, 8391,

DIESEL ENGINES
7367, 7375, 7381, 7384, 7393, 7396, 7546, 7595, 7614
7635, 7687, 7717, 7806, 7822, 7843, 7992, 8318,

DISPERSION
7335, 7344, 7369, 7373, 7380, 7452, 7543, 7577, 7623
7632, 7663, 7673, 7730, 7801, 7815, 7819, 7841, 7846
7866, 7877, 7888, 7903, 7922, 7927, 7957, 7962, 7963
7977, 7985, 7988, 8011, 8013, 8014, 8015, 8016, 8018
8019, 8020, 8021, 8023, 8026, 8027, 8029, 8030, 8031
8032, 8033, 8036, 8037, 8038, 8039, 8041, 8042, 8044
8045, 8049, 8051, 8053, 8056, 8057, 8060, 8061, 8063
8065, 8067, 8068, 8069, 8070, 8071, 8072, 8075, 8077
8078, 8079, 8080, 8082, 8083, 8084, 8087, 8088, 8089
809C, 8092, 8093, 8095, 8096, 8098, 8099, 8100, 8109
8125, 8132, 8143, 8175, 8189, 8216, 8217, 8223, 8247
8270, 8391, 8394, 8401, 8417, 8423, 8440, 8444, 8450
8451, 8460, 8461, 8463,

DUST FALL
7977, 7994, 7995, 8060, 8095,

ECONOMIC LOSSES
8329, 8344, 8352, 8365, 8371, 8373, 8375, 8376, 8380
8385, 8386, 8388, 8389, 8390, 8421, 8441, 844.

ELECTRIC POWER PRODUCTION
7337, 7339, 734C, 7345, 7369, 7398, 7413, 7433, 7452
7459, 7477, 7492, 7507, 7541, 7542, 7573, 7581, 7586
7616, 7618, 7646, 7652, 7664, 7691, 7705, 7710, 7758
7767, 7768, 7778, 7855, 7927, 7958, 7982, 7983, 7986
8037, 8038, 8039, 8045, 8083, 8324, 8372, 8388, 8413

ELECTRICAL PROPERTIES
7489, 7532, 7533, 7624, 7633, 7679, 7694, 7725, 7749
7754, 7797, 8016, 8103, 8112, 8126, 8155, 8156, 8157
8175, 8195, 8212, 8223, 8224,

ELECTROCHEMICAL METHODS
7336, 7337, 7761, 7780, 7826, 7834, 7893, 7937, 7968

ELECTRON MICROSCOPY
7788, 7799, 7921,

ELECTROSTATIC PRECIPITATORS
7336, 7339, 7346, 7378, 7391, 7395, 7400, 7439, 7447
7452, 7486, 7489, 7504, 7505, 7513, 7522, 7529, 7532
7533, 7586, 7591, 7609, 7612, 7633, 7637, 7646, 7667
7681, 7682, 7691, 7694, 7709, 7710, 7717, 7723, 7725
7726, 7729, 7735, 7736, 7737, 7748, 7761, 7762, 7764
7774, 7795, 8011, 8373, 8385, 8452, 8459,

ENFORCEMENT PROCEDURES
8408, 8413, 8424, 8425, 8426, 8432, 8440, 8459,

EPIDEMIOLOGY
8242, 8246, 8249, 8253, 8257, 8260, 8269, 8287, 8290
8299, 8316, 8403, 8458,

ETHYLENE
7442, 7485, 7677, 7704, 7816, 7941, 8097, 8163, 8374
8390,

EUROPE
7333, 7338, 7339, 7342, 7345, 7350, 7359, 7362, 7364
7366, 7369, 7371, 7377, 740C, 7406, 7414, 7419, 7420
7424, 7425, 7430, 7431, 7438, 7439, 7441, 7445, 7452
7459, 7461, 7462, 7463, 7464, 7473, 7475, 7476, 7479
7481, 7489, 7490, 7492, 7494, 7495, 7498, 7501, 7502
7506, 7507, 7508, 7514, 7515, 7516, 7517, 7518, 7519
7521, 7526, 7527, 7528, 7529, 7530, 7540, 7541, 7545
7550, 7558, 7560, 7561, 7575, 7578, 7581, 7585, 7586
7588, 7589, 7593, 7596, 7597, 7598, 7601, 7602, 7603
7604, 7609, 7610, 7611, 7612, 7613, 7614, 7615, 7616
7617, 7623, 7625, 7626, 7633, 7637, 7644, 7645, 7647
7651, 7656, 7663, 7665, 7667, 7672, 7673, 7674, 7675
7676, 7682, 7686, 7694, 7695, 7707, 7709, 7713, 7715
7716, 7723, 7726, 7731, 7735, 7736, 7737, 7739, 7743
7744, 7748, 7753, 7757, 7768, 7775, 7776, 7778, 7779
778C, 7784, 779C, 7791, 7792, 7794, 7797, 7805, 7806
7807, 7811, 7815, 7817, 7819, 7842, 7845, 7851, 7852
7855, 7860, 7865, 7867, 7875, 7876, 7882, 7889, 7895
7902, 7903, 7904, 7905, 7906, 79C7, 7908, 7921, 7927
7934, 7945, 7947, 7955, 7956, 7958, 7959, 7960, 7970
7971, 7978, 7987, 7989, 7993, 7997, 8000, 8002, 8004
8006, 8013, 8014, 8017, 8018, 8025, 8027, 8040, 8044
8045, 8052, 8060, 8061, 8073, 8084, 8085, 8090, 8093
8098, 8099, 8104, 8105, 8106, 81C7, 8109, 8113, 8116
8119, 8120, 8121, 8122, 8129, 8135, 8136, 8137, 8149
8150, 8154, 8160, 8165, 8166, 8168, 8169, 8172, 8177
8178, 8180, 8189, 8190, 8191, 8193, 8195, 8197, 8199
8201, 8206, 8214, 8215, 8217, 8218, 8221, 8222, 8224
8232, 8233, 8235, 8237, 8244, 8249, 8254, 8255, 8256
8273, 8281, 8290, 8296, 83C2, 8303, 8304, 8306, 8314
8322, 8323, 8324, 8330, 8331, 8333, 8338, 8345, 8348
8350, 8354, 8356, 8359, 8360, 8364, 8366, 8370, 8379
8392, 8393, 8397, 8400, 84C2, 8403, 8405, 8408, 8411
8413, 8419, 8422, 8423, 8432, 8434, 8435, 8437, 8438
8449, 8451, 8454, 8456, 8459, 8463,

EYE IRRITATION
7388, 7390, 7446, 8010, 805C, 8054, 8097, 8234, 8243
8251, 8275, 8299, 8310, 8452,

FERTILIZER MANUFACTURING
7336, 7343, 7376, 7383, 7628, 7672, 7678, 7721, 8384

FILTERS
7336, 7338, 7346, 7375, 7391, 7395, 7400, 7405, 7406
7430, 7439, 7449, 7454, 7461, 7462, 7470, 7472, 7474
7476, 7479, 7488, 7494, 7500, 7503, 7520, 7522, 7529
7537, 7549, 7553, 7576, 7583, 7587, 7589, 7591, 7601
7602, 7632, 7633, 7635, 7637, 7646, 7663, 7665, 7675
7689, 7691, 7693, 7695, 7709, 7714, 7722, 7723, 7725
7736, 7752, 7759, 7764, 7765, 7774, 7782, 7795, 7805
7811, 7825, 7829, 7853, 7885, 7896, 7897, 7898, 7899
7900, 7902, 7932, 7934, 7944, 7947, 7953, 7953, 8104
8248, 8360, 8384, 8385, 8452, 8459,

FLAME IONIZATION DETECTOR
7769, 7777, 7836, 7843, 7873, 7893, 7894, 7899, 7916
7936, 7937, 7972, 7986, 8159,

FLUORINE COMPOUNDS
SEE ALSO: HALOGENATED HYDROCARBONS
7403, 7431, 7544, 7587, 7628, 7723, 7783, 7790, 7867
7879, 7898, 7902, 7962, 8004, 8019, 8088, 8105, 8251
8277, 8313, 8326, 8327, 8329, 8334, 8345, 8355, 8357
8358, 8398, 8413, 8440, 8457,

FOOD AND FEED OPERATIONS
7338, 7343, 7387, 7508, 7561, 7700, 7719, 7721, 8247
8315, 8444,

FUEL ADDITIVES
7350, 7375, 7386, 7440, 7478, 7506, 7594, 7595, 7649
7664, 8124, 8398,

FUEL GASES
7350, 7406, 7410, 7433, 7482, 7483, 7495, 7496, 7501
7504, 7505, 7514, 7519, 7525, 7526, 7534, 7550, 7558
7582, 7600, 7627, 7634, 7643, 7660, 7668, 7669, 7670
7683, 7684, 7701, 7724, 7758, 7987, 8165, 8218, 8387
8419, 8455, 8459,

FUEL OILS
7339, 7398, 7405, 7406, 7421, 7442, 7478, 7484, 7487
7488, 7493, 7506, 7515, 7527, 7556, 7577, 7608, 7616
7635, 7660, 7715, 7758, 7774, 7826, 7987, 8038, 8039
8215, 8243, 8266, 8336, 8391, 8401, 8408, 8455, 8459

FURNACES
7335, 7357, 7377, 7395, 7408, 7412, 7417, 7418, 7441
7443, 7449, 7466, 7496, 7516, 7529, 7530, 7548, 7560
7562, 7606, 7609, 7612, 7635, 7650, 7652, 7658, 7659
7689, 7705, 7721, 7736, 7738, 7759, 7762, 7852, 7860
7875, 8350, 8385, 8411, 8422,

GAS CHROMATOGRAPHY
SEE ALSO: FLAME IONIZATION DETECTOR
7363, 7379, 7380, 7399, 7401, 7719, 7777, 7803, 7809
7812, 7825, 7828, 7846, 7848, 7858, 7870, 7871, 7873
7894, 7896, 7900, 7916, 7929, 7936, 7937, 7972, 7974
7986, 7996, 8088, 8089, 8103, 8173, 8287,

GAS SAMPLING
7594, 7691, 7777, 7786, 7822, 7846, 7848, 7856, 7859
7877, 7896, 7898, 7933, 7961, 7973, 7974, 8414,

GAS TURBINES
7547, 7712, 8392,

GASOLINES
7350, 7358, 7368, 7381, 7384, 7399, 7485, 7506, 7510
7635, 7649, 7692, 7708, 7753, 7793, 7828, 7871, 7960
8336, 8396, 8455,

HALOGENATED HYDROCARBONS
7347, 7373, 7542, 7844, 7846, 7882, 7933, 7941, 7955
7962, 7968, 8089, 8126, 8127, 8145, 8146, 8150, 8176
8188, 8204, 8212, 8286,

HEMATOLOGY
7349, 7884, 7916, 8171, 8184, 8202, 8237, 8239, 8244
8250, 8253, 8254, 8255, 8258, 8263, 8271, 8272, 8274
8275, 8276, 8279, 8280, 8281, 8287, 8291, 8292, 8296
8303, 8306, 8307, 8308, 8312, 8452,

HIGHWAYS
7354, 7384, 7513, 7996, 8088, 8336, 8418,

HYDROCHLORIC ACID
7365, 7493, 7580, 7699, 7882, 8126, 8370, 8390,

HYDROGEN SULFIDE
7343, 7363, 7364, 7405, 7415, 7416, 7417, 7419, 7422
7423, 7427, 7429, 7437, 7442, 7447, 7460, 7493, 7496
7504, 7517, 7518, 7519, 7525, 7527, 7536, 7554, 7556
7579, 7608, 7611, 7616, 7621, 7625, 7626, 7634, 7639
7669, 7674, 7676, 7681, 7684, 7685, 7693, 7700, 7716
7726, 7731, 7732, 7733, 7734, 7738, 7739, 7743, 7744
7746, 7755, 7807, 7831, 7848, 7873, 7887, 7893, 7918
7919, 7930, 7937, 8014, 8049, 8117, 8174, 8234, 8251
8364, 8373, 8398, 8457,

INCINERATION
7365, 7390, 7391, 7467, 7491, 7522, 7572, 7622, 7635
7690, 7691, 7740, 7821, 8372, 8416,

INVERSION
7452, 7951, 7980, 8011, 8020, 8036, 8050, 8058, 8062
8078, 8081, 8084, 8091, 8420,

IRON COMPOUNDS
7357, 7395, 7416, 7437, 7474, 7554, 7562, 7610, 7613
7617, 7713, 7726, 7785, 7827, 7853, 7875, 7963, 7989
8003, 8095, 8108, 8160, 8161, 8164, 8190, 8202, 8331

ISOTOPES
7778, 7793, 7827, 7888, 7982, 7983, 8001, 8028, 8119
8252, 8356, 8370,

KRAFT PULPING
7363, 7383, 7447, 7517, 7538, 7539, 7639, 7705, 7727
7763, 7900, 8373,

LABORATORY ANIMALS
8202, 8212, 8231, 8234, 8241, 8243, 8245, 8246, 8248
8252, 8254, 8255, 8256, 8259, 8265, 8272, 8273, 8275
8276, 8278, 8281, 8283, 8286, 8289, 8291, 8293, 8294
8302, 8306, 8312, 8317, 8319, 8321, 8393, 8402,

LASERS
7556, 7824, 7851, 7874, 7895, 7922, 7967, 7976,

LEAD COMPOUNDS
735C, 7374, 7396, 7506, 7513, 7649, 7692, 7708, 7793
785C, 7853, 7963, 7979, 7989, 7990, 7999, 8003, 8005
8028, 8081, 8235, 8251, 8262, 8271, 8322, 8336, 8355
8357, 8363, 839C, 8397, 8420,

LEGAL ASPECTS
7333, 7354, 7377, 7378, 7466, 7590, 7678, 7740, 7758
7771, 7839, 8371, 8372, 8388, 8389, 8392, 8394, 8399
8408, 8410, 8411, 8413, 8414, 8416, 8418, 8419, 8420
8421, 8422, 8423, 8424, 8428, 8431, 8432, 8434, 8436
8438, 8440, 8441, 8447, 8448, 8452, 8453, 8459,

LIGHT RADIATION
7773, 7780, 7781, 7800, 7807, 7816, 7818, 7860, 7909
7928, 7961, 7997, 8012, 8016, 8017, 8024, 8050, 8052
8053, 8059, 8071, 8072, 8074, 8090, 8091, 8097, 8101
8102, 8110, 8148, 8185, 8186, 8206, 8251, 8311, 8338
8345, 8352, 8363, 8398,

LIGHT SCATTERING
7773, 7800, 7804, 7818, 7849, 7878, 7880, 7902, 7917
7938, 7957, 7967, 8022, 8034, 8170, 8197,

MANGANESE COMPOUNDS
75C6, 7511, 7562, 7610, 7785, 7838, 7853, 8003, 8095
8104, 8193, 8199, 8271, 8288,

MATHEMATICAL ANALYSES
SEE ALSO: MATHEMATICAL MODELING
7425, 7461, 7462, 7472, 7494, 7553, 7566, 7589, 7623
7665, 7668, 7764, 7765, 7775, 7797, 7801, 7807, 7823
7827, 7837, 7841, 7851, 7857, 7862, 7864, 7866, 7907
7920, 7927, 7938, 7954, 7960, 7965, 7979, 8011, 8012
8015, 8018, 8021, 8023, 8036, 8037, 8038, 8044, 8045
8048, 8056, 8070, 8079, 8082, 8084, 8090, 8092, 8097
8098, 8099, 8113, 8114, 8119, 8124, 8128, 8129, 8132
8143, 8167, 8186, 8189, 8192, 8197, 8199, 8222, 8223
8399, 8400, 8401, 8461,

MATHEMATICAL MODELING
7538, 7542, 7577, 7647, 7781, 7815, 7874, 7932, 7943
8013, 8015, 8016, 8027, 8051, 8059, 8078, 8083, 8087
81C0, 8128, 8155, 8391, 8394, 8460,

MAXIMUM ALLOWABLE CONCENTRATION
7333, 7340, 7758, 7820, 8281, 8291, 8393, 8395, 8400
8401, 8402, 8403, 8406, 845C,

MERCURY COMPOUNDS
7389, 7785, 7831, 8446,

METAL COMPOUNDS
SEE ALSO: SPECIFIC METAL COMPOUNDS
7404, 7406, 7420, 7432, 7437, 7463, 7475, 7521, 7534
7537, 7542, 7567, 7581, 7621, 7677, 7706, 7728, 7759
7763, 7784, 7785, 7805, 7813, 7838, 7853, 7862, 7888
7897, 7927, 7952, 8C01, 8003, 8022, 8025, 8095, 8120
8130, 8144, 8158, 8176, 819C, 8193, 8195, 8199, 8202
8209, 8225, 8271, 8273, 8289, 8336, 835C, 8363, 8364

METALS
SEE ALSO: METAL COMPOUNDS AND SPECIFIC METAL COMPOUNDS
7372, 7395, 7464, 7466, 7480, 7483, 7511, 7528, 7529
7531, 7575, 7587, 7628, 7677, 7736, 7789, 8003, 8117
8135, 8191, 8193, 8194, 8199, 8201, 8230, 8235, 8313
8326, 8327, 8341, 8359, 8360, 8361, 8363, 8364, 8368
8369, 8370, 8385,

METHANES
7424, 7514, 7526, 7528, 7600, 7668, 7677, 7701, 7704
7738, 7811, 7894, 7918, 7936, 7967, 7979, 7982, 7983
7992, 8101, 8110, 8145, 8166, 8173, 8179, 8206, 8374

MICROORGANISMS
7346, 7360, 7401, 7454, 7551, 7776, 7791, 8006, 8153
8245, 8301, 8306, 8325, 8347,

MINERAL PROCESSING
7333, 7389, 7464, 7495, 7503, 7576, 7588, 7617, 7628
7635, 7654, 7691, 7792, 7977, 8003, 8108, 8242, 8304
8314, 8322, 8413, 8422,

MINERAL PRODUCTS
SEE ALSO: ASBESTOS
7406, 7439, 7519, 7534, 7570, 7581, 7594, 7635, 7644
765C, 7702, 7705, 7728, 7767, 7914, 7985, 8116, 8144
8360, 8366,

MONITORING
7389, 7646, 7707, 7769, 7778, 7790, 7795, 7808, 7812
7814, 7817, 7827, 7831, 7834, 7842, 7845, 7854, 7855
7860, 7864, 7872, 7873, 7879, 7890, 7893, 7903, 7908
7915, 7937, 7939, 7949, 7987, 7992, 8357, 84C6,

NICKEL COMPOUNDS
7404, 7437, 7648, 7838, 8095, 8190, 8336,

NITRATES
7735, 7862, 7931, 7995, 8C03, 8005, 8010, 8050, 8054
8055, 8284, 8329, 8346, 8455,

NITROGEN OXIDES
7344, 7355, 7358, 7365, 7367, 7370, 7375, 7378, 7392
7396, 7398, 7413, 7431, 7441, 7446, 7456, 7467, 7468
7469, 7485, 7488, 7512, 7534, 7555, 7570, 7572, 7595
7614, 7638, 7641, 7648, 7666, 7688, 7691, 7708, 7735
7741, 7758, 7786, 7814, 7816, 7862, 7877, 7890, 7893
7918, 7924, 7925, 7952, 7976, 7992, 8008, 8010, 8050
8054, 8057, 8067, 8085, 8086, 8091, 8094, 8097, 8102
8112, 8113, 8115, 8118, 8131, 8148, 8154, 8166, 8171

NITROGEN OXIDES (Cont'd)
8182, 8183, 8207, 8214, 8241, 8244, 8245, 8251, 8264
8267, 8276, 8281, 8282, 8295, 8312, 8317, 8318, 8344
8355, 8371, 8392, 8396, 8397, 8404, 8420, 8427, 8452
8457,

ODORIMETRY
7343, 7351, 7383, 7387, 7802, 7807, 7873, 7885, 7886
7887, 7919, 7930, 8103, 8159, 8212, 8283, 8393, 8444

ODORS
7335, 7343, 734 , 7351, 7360, 7363, 7365, 7380, 7387
7392, 7444, 7447, 7499, 752C, 7639, 770C, 7719, 7721
7722, 7730, 7802, 7807, 7848, 7873, 7885, 7886, 7887
7889, 7896, 7899, 7900, 7919, 7930, 7974, 8103, 8159
8393, 8404, 8416, 8422, 8444, 8457, 8462,

OPEN BURNING
7453, 8416,

ORGANIC NITROGEN COMPOUNDS
7343, 7351, 7383, 7399, 7551, 7656, 7676, 7844, 7886
7896, 7899, 7905, 7919, 7929, 7930, 7955, 7956, 7975
8000, 8176, 8187, 8220, 8233, 8275,

ORGANIC SULFUR COMPOUNDS
7343, 7351, 7363, 7383, 7447, 7493, 7517, 7519, 7617
7639, 7673, 7693, 7732, 7848, 7873, 7886, 7887, 7892
7893, 7900, 7930, 7937, 8161, 8174, 8190, 8284, 8457

OXIDANTS
7360, 7818, 7834, 7931, 801C, 8050, 8054, 8074, 8085
8097, 8141, 8245, 8369, 839C, 8420,

OZONE
7360, 7396, 7431, 7446, 776C, 7780, 7801, 7814, 7818
7833, 7834, 7866, 7893, 7907, 7909, 7931, 7976, 7988
8007, 8027, 8050, 8054, 8062, 8086, 8094, 8097, 8102
8166, 82CC, 8209, 8210, 8211, 8245, 8251, 8282, 8285
8310, 8325, 8329, 8343, 8344, 8349, 8351, 8352, 8353
8452, 8457,

PARTICLE COUNTERS
7553, 7691, 7776, 7798, 7804, 7823, 7835, 7849, 7863
7875, 7880, 7895, 7917, 7926, 7966, 8040, 8223,

PARTICLE SIZE
7339, 7340, 7397, 7400, 7423, 7435, 7464, 7509, 7549
7557, 7570, 7583, 7589, 7617, 7650, 7672, 7751, 7755
7771, 7772, 7774, 7776, 7779, 7782, 7798, 7800, 7804
7805, 7813, 7823, 7835, 7840, 7850, 7851, 7863, 7880
7895, 7912, 7921, 7932, 7934, 7935, 7938, 7940, 7944
7953, 7954, 7964, 7965, 7966, 7995, 8005, 8016, 8034
8040, 8055, 8059, 8061, 8124, 8144, 8153, 8170, 8194
8197, 8215, 8360,

PARTICULATE SAMPLING
7340, 7594, 7771, 7779, 7785, 7813, 7821, 7849, 7878
7906, 7912, 7963,

PARTICULATES
SEE ALSO: POLLENS AND SMOG
7334, 7335, 7336, 7339, 7340, 7342, 7344, 7345, 7346
7347, 7348, 7357, 7363, 7366, 7369, 7371, 7373, 7374
7375, 7378, 7391, 7392, 7393, 7397, 7398, 7400, 7406
7411, 7412, 7426, 7427, 7431, 7435, 7438, 7439, 7443
7446, 7450, 7452, 7454, 7455, 7457, 7461, 7462, 7464
7465, 7466, 7467, 7470, 7471, 7472, 7473, 7474, 7476
7477, 7479, 7486, 7488, 7489, 7491, 7494, 7498, 7503
7509, 7512, 7520, 7529, 7533, 7534, 7537, 7542, 7547
7549, 7553, 7555, 7557, 756C, 7568, 7569, 7572, 7574
7575, 7576, 7580, 7583, 7585, 7586, 7587, 7588, 7589
7591, 7594, 7598, 7601, 7602, 7612, 7615, 7619, 7624
7629, 7633, 7635, 7637, 7646, 7647, 7649, 7652, 7653
7667, 7672, 7675, 7682, 7686, 7689, 7691, 7692, 7696
7697, 7705, 7707, 7709, 7710, 7714, 7722, 7723, 7725
7726, 7727, 7735, 7736, 7737, 7740, 7751, 7752, 7758
7760, 7761, 7762, 7765, 7771, 7774, 7775, 7779, 7781
7782, 7784, 7785, 7788, 7792, 7793, 7795, 7796, 7797
7799, 7800, 7805, 7806, 7813, 7820, 7821, 7823, 7829
7835, 7840, 7841, 7845, 7849, 7850, 7852, 7855, 7857
7863, 7869, 7870, 7874, 7875, 7876, 7878, 7880, 7890
7891, 7897, 7902, 7904, 7906, 7917, 7921, 7927, 7932
7934, 7938, 7940, 7944, 7954, 7963, 7964, 7965, 7966
7977, 7978, 7979, 7985, 7986, 7987, 7992, 7995, 7997
7999, 8001, 8003, 8004, 8005, 8008, 8009, 8011, 8012
8013, 8014, 8C16, 8017, 8018, 8022, 8028, 8031, 8033
8036, 8038, 8040, 8043, 8045, 8047, 8049, 8050, 8053
8055, 8057, 8059, 8060, 8071, 8072, 8073, 8077, 8080
8081, 8089, 8090, 8091, 8092, 8095, 8096, 8125, 8143
8149, 8153, 8170, 8175, 8179, 8187, 8189, 8194, 8197
8215, 8216, 8222, 8223, 8224, 8234, 8240, 8242, 8243
8245, 8246, 8247, 8249, 8266, 8267, 8273, 8288, 8301
8304, 8309, 8311, 8314, 8315, 8322, 8323, 8324, 8342
8344, 8345, 8348, 8350, 8355, 8360, 8366, 8371, 8373
8378, 8383, 8390, 8394, 8397, 8398, 8399, 8401, 8413
8414, 8415, 8416, 8419, 8420, 8422, 8436, 8440, 8457
8460, 8461, 8462, 8463,

PESTICIDES
7336, 7373,

PETROLEUM REFINING
7527, 7618, 7622, 7643, 7651, 7678, 7681, 7691, 7900
7974, 7996, 8234, 8253, 832C, 8422,

PHOSPHORUS COMPOUNDS
7518, 8000,

PHOTOCHEMICAL REACTIONS
7356, 7367, 7390, 7396, 7485, 7810, 7818, 8010, 8014
8035, 8046, 8C47, 8050, 8054, 8074, 8076, 8085, 8086
8091, 8094, 8097, 8101, 81C2, 8110, 8118, 8133, 8140
8141, 8142, 8148, 8151, 8163, 8166, 8171, 8186, 8210
8211, 8213, 8220, 8232, 8251, 8335, 8352, 8355, 8397

PHOTOMETRIC METHODS
7691, 7774, 7817, 7818, 7834, 7835, 7842, 7880, 7883
7893, 7902, 7905, 7937, 7960,

PLANS AND PROGRAMS
SEE ALSO: AREA SURVEYS AND CONTROL PROGRAMS
7678, 7737, 7830, 7837, 789C, 7920, 7939, 7943, 8257
8269, 8290, 8365, 8413, 8418, 8427, 8428, 8429, 8432
8433, 8438, 8455, 8459,

PLASTICS
7778, 7825, 7933,

PNEUMOCONIOSIS
SEE ALSO: RESPIRATORY DISEASES AND BRONCHITIS
7464, 8249, 8304, 8314,

POLLENS
7722, 7911, 7913, 8305, 8315,

POLYNUCLEAR COMPOUNDS
SEE ALSO: PYRENES AND BENZOPYRENES
7393, 7796, 7868, 7869, 7929, 7959, 7975, 7989, 8139
8140, 8142, 8286, 8302,

PRECIPITATION
7374, 7921, 8000, 8014, 8025, 8026, 8028, 8033, 8040
8053, 8073, 8081, 8334, 8345, 8363, 8408, 8449, 8463

PULMONARY FUNCTION
SEE ALSO: RESPIRATORY FUNCTIONS
7787, 8142, 8234, 8236, 8240, 8250, 8255, 8257, 8260
8266, 8282, 8293, 8294, 8295, 8298, 8301, 8307, 8318

PYRENES
SEE ALSO: BENZOPYRENES
8140,

RADIOACTIVE RADIATION
7340, 7398, 7551, 7663, 7778, 7782, 7784, 7813, 7827
7888, 7927, 7982, 7983, 7990, 8001, 8026, 8044, 8152
8209, 8225, 8232, 8252, 8356, 8370,

REACTION KINETICS
7359, 7370, 7420, 7432, 7490, 7502, 7518, 7535, 7554
7559, 7563, 7568, 7569, 7570, 7573, 7626, 7658, 7662
7702, 8035, 8046, 8047, 8050, 8054, 8086, 8091, 8094
8097, 8102, 8107, 8111, 8112, 8115, 8118, 8121, 8122
8123, 8129, 8144, 8145, 8146, 8147, 8151, 8152, 8155
8157, 8162, 8164, 8166, 8174, 8181, 8182, 8194, 8199
8201, 8203, 8204, 8214, 8219, 8225, 8228, 8229, 8230

REACTION MECHANISMS
7341, 7523, 7543, 7554, 7577, 8016, 8046, 8050, 8074
8101, 8111, 8118, 8127, 8133, 8134, 8137, 8141, 8145
8151, 8155, 8157, 8158, 8174, 8178, 8181, 8182, 8213
8220, 8364, 8370,

RESEARCH PROGRAMS
7464, 7527, 7538, 7618, 7678, 7705, 7964, 7965, 8019
8033, 8409, 8429, 8435, 8438, 8455,

RESPIRATORY DISEASES
SEE ALSO: BRONCHITIS AND PNEUMOCONIOSIS
7336, 7346, 7388, 7390, 7394, 7849, 8235, 8236, 8237
8240, 8243, 8244, 8247, 8253, 8257, 8261, 8264, 8265
8266, 8267, 8268, 8269, 827C, 8273, 8275, 8276, 8282
8287, 8293, 8294, 8297, 8299, 8300, 8301, 8304, 8305
8307, 8309, 8311, 8312, 8314, 8315, 8320, 8403, 8407
8452,

RESPIRATORY FUNCTIONS
SEE ALSO: PULMONARY FUNCTION
7395, 7472, 7474, 7484, 7840, 7882, 7884, 7889, 7894
8033, 8060, 8173, 8189, 8236, 8241, 8245, 8250, 8252
8255, 8264, 8282, 8291, 8297, 8298, 8303, 8307, 8355
8366, 8460,

RESPIRATORY SYSTEM
7775, 8234, 8236, 8240, 8241, 8243, 8245, 8246, 8247
8248, 8249, 8256, 8259, 826C, 8276, 8281, 8282, 8290
8298, 8303, 8305, 8307, 8309, 8315, 8317,

SAMPLERS
SEE ALSO: SOURCE SAMPLING
7336, 7346, 7390, 7395, 7472, 7491, 7637, 7691, 7769
7774, 7785, 7789, 7791, 7795, 7813, 7820, 7825, 7829
7830, 7831, 7835, 7836, 7846, 7850, 7853, 7856, 7859
7869, 7878, 7888, 7897, 7910, 7911, 7912, 7913, 7921
7926, 7933, 7947, 7953, 7963, 7974, 7978, 7995, 8005
8006, 8055, 8C63, 8187, 8313,

SCRUBBERS
7347, 7378, 7388, 7389, 7391, 7392, 7400, 7405, 7408
7411, 7414, 7426, 7435, 7438, 7439, 7455, 7460, 7471
7473, 7481, 7490, 7491, 7492, 7498, 7499, 7507, 7522
7529, 7530, 7542, 7544, 7548, 7559, 7562, 7563, 7566
7568, 7569, 7574, 7575, 7580, 7593, 7608, 7629, 7631
7633, 7637, 7644, 7645, 7646, 7657, 7658, 7662, 7674
7680, 7685, 7691, 7696, 7697, 7703, 7705, 7706, 7710
7714, 7727, 7728, 7736, 7748, 7757, 7762, 7786, 7808
7839, 8108, 8373, 8384, 8385, 8452, 8459,

SIMULATION
7482, 7542, 7781, 8043, 8068, 8097, 8338, 8350, 8394

SKIN
7390, 7394, 7889, 8212, 8243, 8248, 8259, 8273, 8283
8305,

SMOG
7358, 7367, 7368, 7413, 7446, 7639, 7689, 7824, 8046
8050, 8054, 8076, 8085, 8094, 8234, 8245, 8251, 8257
8265, 8275, 8282, 8310, 8344, 8355, 8397, 8455,

SOLVENTS
7379, 7691, 8139, 8176,

SOURCE SAMPLING
SEE ALSO: SAMPLERS
7363, 7387, 7491, 7594, 7773, 7821, 7822, 7829, 7839
7873, 7926, 8391, 8414,

SO2 REMOVAL (COMBUSTION PRODUCTS)
7378, 7405, 7415, 7417, 7418, 7419, 7420, 7422, 7423
7426, 7428, 7429, 7432, 7436, 7443, 7448, 7449, 7451
7458, 7459, 7463, 7473, 7481, 7488, 7490, 7492, 7496
7498, 7504, 7505, 7507, 7509, 7511, 7517, 7521, 7523
7524, 7525, 7527, 7530, 7536, 7541, 7543, 7548, 7559
7562, 7563, 7564, 7565, 7566, 7567, 7568, 7569, 7570
7573, 7577, 7579, 7581, 7584, 7586, 7588, 7592, 7593
7594, 7604, 7606, 7607, 7608, 7609, 7610, 7612, 7613
7616, 7618, 7620, 7625, 7629, 7631, 7644, 7650, 7652
7654, 7655, 7656, 7658, 7659, 7661, 7662, 7664, 7666
7680, 7681, 7683, 7684, 7685, 7695, 7697, 7699, 7702
7703, 7705, 7706, 7710, 7716, 7720, 7726, 7728, 7729
7731, 7732, 7733, 7734, 7738, 7739, 7743, 7744, 7746
7747, 7755, 7757, 7758, 7760, 7765, 7766, 7767, 7768
7898, 7914, 8047, 8120, 8217, 8227, 8373, 8382, 8391
8452,

SPARK IGNITION ENGINES
7367, 7402, 7973,

SPECTROMETRY
7336, 7337, 7379, 7380, 7386, 7390, 7395, 7648, 7785
7795, 7805, 7810, 7812, 7817, 7853, 7858, 7862, 7865
7868, 7870, 7877, 7907, 7914, 7918, 7929, 7946, 7961
7969, 7972, 7975, 7976, 7981, 8040, 8103, 8107, 8110
8128, 8131, 8138, 8159, 8181, 8196, 8206, 8207, 8228
8232,

SPECTROPHOTOMETRY
7337, 7360, 7395, 7471, 7511, 7691, 7796, 7804, 7812
7834, 7838, 7844, 7853, 7857, 7869, 7872, 7928, 7931
7937, 7995, 8007, 8008, 8127, 8142, 8154, 8181, 8184
8287,

STREETS
7353, 7385, 7979, 8270,

SULFUR COMPOUNDS
SEE ALSO: HYDROGEN SULFIDE
7351, 7357, 7364, 7375, 7376, 7392, 7405, 7414, 7416
7417, 7418, 7422, 7423, 7427, 7428, 7429, 7432, 7436
7437, 7443, 7451, 7455, 7459, 7463, 7487, 7496, 7498
7504, 7505, 7507, 7517, 7530, 7548, 7554, 7556, 7566
7567, 7568, 7584, 7586, 7593, 7604, 7605, 7607, 7608
7610, 7611, 7612, 7613, 7617, 7621, 7634, 7654, 7656
7661, 7669, 7676, 7683, 7685, 7693, 7710, 7713, 7716
7720, 7726, 7728, 7731, 7733, 7742, 7743, 7744, 7755
7758, 7763, 7826, 7827, 7873, 7886, 7888, 7900, 7914
7918, 7937, 7962, 7970, 7995, 8003, 8005, 8014, 8019
8049, 8055, 8061, 8088, 8091, 8108, 8117, 8120, 8121
8122, 8136, 8160, 8161, 8174, 8225, 8234, 8268, 8284
8289, 8337, 8342, 8356, 8357, 8363, 8366, 8369, 8370
8408,

SULFUR OXIDES
7333, 7351, 7357, 7363, 7365, 7369, 7382, 7392, 7396
7398, 7427, 7431, 7437, 7452, 7455, 7457, 7458, 7467
7502, 7512, 7535, 7548, 7554, 7572, 7621, 7634, 7653
7659, 7691, 7696, 7699, 7723, 7731, 7737, 7758, 7761
7765, 7808, 7817, 7818, 7819, 7830, 7842, 7846, 7854

SULFUR OXIDES (Cont'd)
7873, 7877, 7882, 7883, 7890, 7893, 7903, 7908, 7915
7918, 7924, 7928, 7937, 7943, 7945, 7948, 7949, 7952
7962, 7971, 7976, 7977, 7978, 7980, 7984, 7987, 7992
7994, 8002, 8004, 8008, 8014, 8019, 8020, 8032, 8037
8038, 8039, 8042, 8047, 8049, 8050, 8057, 8060, 8064
8076, 8085, 8091, 8093, 8096, 8106, 8121, 8122, 8129
8130, 8133, 8150, 8160, 8166, 8172, 8174, 8176, 8180
8185, 8190, 8193, 8196, 8199, 8205, 8221, 8225, 8234
8236, 8247, 8251, 8253, 8260, 8264, 8265, 8267, 8281
8282, 8309, 8310, 8311, 8318, 8320, 8323, 8329, 8331
8333, 8337, 8338, 8339, 8340, 8341, 8342, 8344, 8348
8354, 8355, 8356, 8359, 8361, 8366, 8367, 8369, 8370
8371, 8390, 8391, 8394, 8399, 8401, 8403, 8405, 8406
8408, 8413, 8415, 8416, 8420, 8423, 8424, 8427, 8436
8440, 8449, 8450, 8452, 8457,

SYNERGISM
7346,

TESTING FACILITIES
7542, 7798, 7884, 7919, 7941, 8036, 8043, 8082, 8097
8200, 8246, 8275, 8308, 8312, 8317, 8340, 8370,

TEXTILES
7523, 7524, 7675, 8360,

THERMODYNAMICS
7359, 7410, 7448, 7482, 7554, 7607, 7626, 7662, 7750
7823, 8101, 8105, 8106, 8111, 8116, 8126, 8129, 8130
8131, 8136, 8145, 8146, 8147, 8155, 8157, 8160, 8161
8162, 8167, 8186, 8196, 8204, 8208, 8229,

THIN-LAYER CHROMATOGRAPHY
7904, 7959,

THRESHOLDS
7343, 7351, 7360, 7383, 7919, 7930, 8159, 8234, 8283
8323, 8357, 8358, 8393, 8400, 8402, 8403, 8404, 8405

TOPOGRAPHIC INTERACTIONS
7957, 7977, 7981, 8013, 8027, 8032, 8036, 8057, 8068
8071, 8078, 8079, 8251, 8451,

TOXICITY
7337, 7360, 7390, 7431, 8234, 8243, 8244, 8245, 8248
8251, 8272, 8275, 8276, 8277, 8281, 8287, 8288, 8291
8306, 8312, 8313, 8316, 8325, 8331, 8343, 8345, 8348
8351, 8405, 8456,

TRANSPORTATION
SEE ALSO: AIRCRAFT, GAS TURBINES, DIESEL ENGINES, SPARK IGNI
VEHICLES
7341, 7349, 7352, 7355, 7356, 7386, 7407, 7424, 7430
7433, 7434, 7440, 7469, 7475, 7480, 7483, 7484, 7501
7510, 7531, 7546, 7550, 7555, 7571, 7596, 7597, 7599
7600, 7618, 7619, 7624, 7635, 7636, 7638, 7641, 7671
7679, 7687, 7694, 7698, 7701, 7708, 7711, 7717, 7741
7745, 7749, 7750, 7754, 7784, 7979, 7994, 8026, 8218
8360, 8372, 8392, 8396, 8409, 8418,

TREES
7380, 7431, 7551, 8031, 8323, 8324, 8326, 8327, 8333
8337, 8340, 8345, 8348, 8353, 8354, 8357, 8390,

URBAN AREAS
7352, 7353, 7356, 7382, 7384, 7385, 7396, 7590, 7758
7785, 7869, 7936, 7963, 7965, 7979, 7981, 7987, 7989
7995, 7996, 7999, 8000, 8C03, 8004, 8005, 8008, 8019
8020, 8022, 8029, 8038, 8040, 8042, 8048, 8053, 8066
8080, 8081, 8096, 8235, 8242, 8253, 8261, 8267, 8270
8293, 8294, 8309, 8311, 8313, 8320, 8322, 8337, 8342
8359, 8361, 8363, 8371, 8415, 8418, 8427, 8428, 8451

VANADIUM COMPOUNDS
7337, 7502, 7535, 7766, 7785, 7989,

VEGETABLES
8313, 8325, 8333, 8338, 8344, 8349, 8356, 8390,

VEHICLES
7349, 7352, 7353, 7354, 7356, 7358, 7362, 7367, 7381
7382, 7384, 7385, 7390, 7396, 7407, 7468, 7485, 7510
7546, 7614, 7618, 7642, 7679, 7687, 7691, 7711, 7745
7750, 7754, 7793, 7819, 7828, 7977, 7979, 7987, 7992
8008, 8088, 8270, 8292, 8318, 8336, 8352, 8398, 8409
8413, 8416, 8427, 8449, 8457,

VISIBILITY
7832, 7891, 7993, 7997, 8C09, 8045, 8251,

ZINC COMPOUNDS
7568, 7621, 7785, 7853, 7963, 8160, 8164, 8178, 8219

AUTHOR INDEX

All personal authors are listed together in this index. First authors are not separated.

AUTHOR INDEX

ABEGG J L 8233
ADACHI K 7643
ADAMS C E 74C4
ADLER H I 8433
ADOLF G 84C8
AGENO H Y 7824
AGNESE G 829C
AHLQUIST N C 8C22
AHLQVIST H 74C5
AHRENS D 8062
AJEMIAN R S 7769
AKAI S 8123
AKKERBERG I I 7333
ALBERTSON M L 81CC
ALIEV G M A 74C6
ALKEZWEENY A J 8CC9
ALKIRE H L 7977
ALLEN E R 81C1
ALLEN T M 7926
ALTMAN M 74C7
ALTSHULLER A P 81C2
8C1C
AMOORE J E 8103
ANDERSON G W 7880
ANDERSON J B 8C66
ANDERSON P J 7582
ANDERSON N G 8433
ANDREEVA N E 81C7
ANGELILLO B 81C4
ANTAL A 8235
ANYIGBO J 7332
AOKI N 7846
AOYAMA M 7381
APICIANAKIS J C 7990
ARAI T 7952
ARAI Y 8265
ARAKAWA M 7940
ARCHER A 8411
ARDEVAN E 8235
ARNE V L 7547
ARNOLD O M 7412
7411
ASAI M 7727
ASAKAWA T 7952
ASHBROOK L 7632
ASHTON J T 81C5
ASTHEIMER R W 7773
ATHANASSIADIS Y C 7337
7336
ATKINS R S 8152
AUBERT J 7791
AUBRY M 81C6
AUERBACH S I 8433
AUSTIN H C 7413
AVERY C 8031
AYER H E 7774
AYRES R U 8412
AYRES S M 8236
AZATYAN V V 81C7
BAB IN V I 7775
BABA T 7382
BABAJANIAN D P 7776
BABB S E JR 8192
BACON J R 7414
BACON R F 7415
7418
7417
7416
81C8
BAEHR J 7419
BAINES W D 8075
BALBO W 8237
BALCHUM O J 8241
8173
BARES J 742C
BARNHARDT E A 8012
BARRER R M 81C9
BARRETT G V 8238
BARRETT L B 8371
BARRETT R E 7421
BARRETT W J 7777
BARRINGER A R 7877
BARTELL R P 74C3
BARTH C A 8067
BARZ H G 7778
BASHIROVA F N 8322
BAUM E J 811C
BAUM K M 7423
7422
BAUMANN R 7908
BEALL S E 8433
BEARD R R 8239
BECKER P M 8157
BECKLAKE M R 8240
BECKMAN J A 7756
BEDUE M 7424
BELEVITSKIY A M 7425
BELL J P 7924
BELLES F E 8229
BENARIE M 7779
BENCOWITZ I 7417
BENNER R C 7427
7429
7428
BENNETT D J 7756
BENSON S W 8147
8145
8127
8126

BENSON S W (CONT'D) 8146
8155
8111
82C3
82C4
BERGER H 743C
BERGMANN W 8168
BERINDAN C 7431
BERLYAND M E 8013
BERNAL E 8275
BERNERT J 7338
BERSIS D S 7780
BERTRAND R R 77C2
BESSEN A 7781
BETTELHEIM J 8415
BEUSCHLEIN W L 7432
BIEDERMAN N P 7433
BIERBAUM P H 8394
BILLETDEAUX A C 7816
BIRMINGHAM B W 7434
BISHOP C E 8210
BISTOWISH J M 8416
BLACET F E 8213
BLACHOWICZ E 8359
BLACK G 8112
BLANKMEYER H C 7567
BLINOVA E A 7333
BLOKKER P C 8014
BOCKEL V 7794
BOERTITZ S 8323
BOGEN D C 7782
BOHLANDER R F 7783
BONN D E 7435
BONNEFOIS J 8113
BONSALL R A 7436
BORODINA V M 7776
BORTOLI M D 7784
BOSENER R 8324
BOSMAN A R 824C
BOSWELL M C 7437
BOUBEL R W 8372
BOUQUIAUX J 7978
BOWEN J A 7915
BOWMAN D H 7580
BOYADJIEV H 749C
BRANDT H 7439
7438
BRAR S S 7785
BRAS G H P 8114
BRAVO H 7979
BRAXTON H G 744C
BREITBACH F 7441
BRENNAN E 8325
BRESEE J C 8433
BREWER C C 7442
BRICARD J 8224
BRIGGS G A 8015
BRINEY S 8138
BROCK J R 8016
BROCKE W 7339
BRODDA H P 8185
BRODDO A 8226
BROWN E H 7434
BROWN F B 8115
BROWN R A 7929
BROWN R F 7533
BRUECKER W 7694
BRYANTSEVA N F 8116
BRYSON R A 8071
BUBLIK A I 7603
BUCKLEY D H 8117
BUCKLEY R D 8241
BUDDENHAGEN I W 7551
BUDYKO M I 8C17
BUECHLEY R W 8242
BUFALINI J J 8118
8148
BUFFO J 8031
BULANG W 8119
BUNYARD F L 8373
8378
BUONPASTORE E 7549
BURDICK C L 7786
BURGER E J JR 7787
BURGESS W D 7443
BURGWALD T 78C3
BURMANN F J 7915
BURNETT W E 7444
BURNS A F 7751
BURTON C S 8186
BURTON E S 8417
BURTON J 78C3
BUSWELL R F 7698
BYE JORGENSEN J S 7445
BYERS R L 7788
BYZOVA N L 8018

CANOVALI L L 7447
CANTOR S 7448
CARLS E L 7570
CARPENTER F R 7449
CARSEY E A 7450
CARSON J E 8021
7980
8020
8019
CARSON T R 8243
CARTER B M 7451
CASSELL E J 8311
CASSIDY F J 7929
CATCHPOLE S 7452
CATHEY J 83C5
CAULFIELD J G L 7559
CEMBER H 7340
CEROVSKY J 8449
CESTA R P 84C4

CHANG R 8228
CHANG Y 8142
CHAPMAN L D 8433
CHAPMAN R L 7836
CHAPRON Y 7790
CHARLSON R J 8022
CHARMBURY H B 7453
CHARPIN F 7791
CHARPIN J 7791
CHATIGNY M A 7454
CHERNYY I I 7792
CHERTKOV B A 8121
8122
8120
7459
CHESTERS G 8028
CHIAKI T 8023
CHIGUSA M 8123
CHIO H T 81C9
CHOLAK J 8271
CHOULAT G 7441
CHOW T J 7374
7999
7793
CHZHEN TSI C 8393
CIUHANDU G 7794
CLARENBURG L A 7462
7461
CLARK A M 7463
CLARY R 8347
CLASS C R 7434
CLAYTON G D 7795
CLEARY G J 7796
7393
CLUTTON BROCK J 8244
COCHRAN J A 8CC1
COENEN W 7797
COFFIN D L 8245
COHEN A 8140
COHEN D 8294
8293
COHEN N 8094
COLE A L 8024
COLE J E III 7798
COLE P 8124
COLEMAN L F 7542
COLLISON H A 7894
COMPTON C C 8327
8326
CONRADI C R 8246
CONRATH B J 7907
COOK C C 7587
CORCORAN J F 7799
CORCORAN W H 8128
CORNETT M S 7465
CORONA L T 7979
COSTIN J M 8125
COSTONIS A C 8353
COUGHANOWR D R 8047
COWAN D W 8247
COWEN P S 7466
COWSER K E 8433
CRAWFORD P B 8374
CRIST R H 8115
CROCKER T T 8248
CROCKER T D 8375
CROSS F L JR 7467
CROUSE G D 7468
CRUICKSHANK F R 8126
8127
CULLER B L 8433
CURLIN J W 8433
DABBERT A F 8249
DAGNAC P 8221
DAI Y B 81C0
DAIGH H C 7469
DAINORA J 7483
DALQUEN P 8249
DALY N S 7414
DALZELL W H 78C0
DANCY T E 7471
DANIEL W A 7341
DATZ B 8433
DAVIES 7472
DAVIS D R 8351
DAVIS J W 7788
DAVIS O A 8376
DAVYDOV G Z 7425
DAWE R A 8105
DAYMON D 7931
DE BEAULIEU H 8233
DE LA RIVA C 8044
DE TURVILLE C M 8045
DEANE M 8269
DEARDORFF J W 7801
DECKER H M 8153
DEICHMANN W B 8275
7399
DELHAYE J 8224
DELWICHE C C 8328
DELZENNE A 7473
DENNIS R 7474
DENNY R W 8142
DERBES V J 8315
DESAI S V 8128
DESGRANDCHAMPS G 8129
DESTRIAU M 8113
DEYNAT G 7476
DICKENS W A 8130
DICKERSON R C 8315
DICKS J B JR 7477
DIETZ R N 8209
DIKUN P P 7342
DIMPFL L H 7478
DINERMAN C E 8131

DINMAN B D 8250
DISHON M 8132
DOBBINS R A 7798
DOERR K H 7481
DOMON T 7329
7802
7919
DONATI E J 8243
DONDERO N C 7444
DORMAN R G 7479
DOUTHIT W H 7480
DOYLE E F 7636
DRAVNIEKS A 7803
DRECHSEL H 7481
DRISCOLL J N 7961
8133
DRISKELL J C 7328
DRIVER C H 8031
DROZDOVA V P 8025
DRUMMOND L J 8134
DRURY L D 8C72
DUFFY A R 7483
7482
DUNHAM L J 8259
DUNN J F JR 7804
DYMENT J 7805

EAKIN B E 7582
EARL J L 7959
EARLEY W T 7594
EASLEY W C 8183
EBERSOLE G C 7484
ECCLESTON B H 7485
ECKELL J 8135
EDMINSTEN N G 8377
EDMISTEN N G 8378
EDMONDS R 8C31
EGAN R T 7486
EGI K 7487
EGUCHI Y 7488
EIDTMANN H 78C6
EISHOLD H G 7489
EKMAN G 7807
EL MESSIRI I A 7641
ELENKOV D 7490
ELFERS L A 7831
ELLERTSON F E 8327
ELLSWORTH R D 7491
EMI J 7764
ENDO R 7981
7343
8444
ENDOW N 8230
ENGDAHL R B 7491
ENGLISH J 7808
ERDOS E 8136
7420
EREMENKO N K 8137
ERMAN J E 7493
ERMOLAEV M I 7494
ESPOSITO G G 78C9
ESTACA J A 8297
ESTES F L 7810
8138
ESUMI Y 7869
7868
EVANS B M 8379
7495
EVERS R L 7379
EVERY R L 7496
EWING G E 8131
EYE M G 7368

FABIAN P 8027
FAGLEY W S 7497
FAIGIN H 7931
FAITH W L 8450
FALK H L 8139
FALTOT G 7790
FARINE J C 8211
8210
FARMER J R 8394
FARRE RILS F 7811
FASHMUKHOVA S V 83C7
FATIADI A J 8140
FATTINGER V 7498
FAWCETT R L 7499
FAY J A 7344
FEINSILVER L 8243
FELCH E L 75C0
FELDMAN F J 7838
FELDSTEIN M 7856
8251
7812
FELIX R 7345
FENN W O 8252
FENSTERSTOCK J C 8418
FERRAN G H 7813
FFOOKS R C 75C1
FIELD J P 7378
7664
FILATOV Y V 75C2
FILBEY A H 7440
FILLER M E 8153
FINKELSTEIN H 7346
FINLAYSON A I 8276
FISER J 7934
FITT T C 75C5
75C4
FLEISCHER V 78C6
FLEMING E P 75C5
7504
FONTIJN A 7814
FOOTE C S 8142
822C

FCOTE C S (CONT'D) 8141
FORTAK H 7815
FOSTER A R 78C4
FOURNES L 8221
FOUTS J R 8286
FRANCIS C W 8028
FRANCIS W 75C7
FRANCOIS H 779C
FRANKE R H 8238
FRANKE W 8330
FRANKLIN U M 8363
FRANZKY U 75C8
FREED C C 824C
FREEDMAN R W 7595
FREILAND R S 7816
FRENZEL C W 8C29
8030
FRESHWATER D C 7709
FREVEL L K 75C9
FRIEDLANDER S K 8143
FRITSCHEN L J 8031
FRYSINGER G R 7510
FUHRMANN H 7817
FUJIE K 7975
FUJII T 8039
7347
FUJINO T 8253
FUJITA M 7511
FUJIWARA K 8187
FUKUDA S 7887
FUKUI T 8289
FUNAKI H 7363
FURNAS C C 8144
FURUYAMA S 8145
8147
8146
FUSCO S J 7823

GANDHI K 7520
GANZ S N 7512
GARBER M J 8346
GARDNER C O 7513
GARNHAM G L 7988
GASIOROWSKI K 7515
GASKILL J R 7348
GATZ D F 8033
8066
8032
GAY B W 8118
GAY B W JR 8148
GENDRE R 7516
GEORGII H W 8149
GERBER S B 7926
GHILARDI G 8233
GIANNELLI S JR 8236
GIBBENS H R 8364
GIBBONS J H 8433
GIFFORD F A 8433
GILBERT T 8451
GILOT B 8106
GINODMAN G M 7517
GICIA F 7518
GLADKIY A V 8150
GLEIM W K T 7733
GLUUD W 7519
GOAR B G 7655
GOETHERT M 8254
8255
GOETZ A 7818
GOFF G B 7712
GOLDEN D M 8147
8204
8145
8146
GOLDENBERG D M 7889
GOLDFIELD J 7520
GOLDMAN H I 8240

GOLDSCHMIDT K 7521
GOLDSMITH J R 7349
GONIK A F 74C6
GOODRICH J E 7478
GOODWIN J E 8360
GOOETZ C 8441
GORBACHEV B I 7593
GRAEFE K 7819
GRAFOVA G Y 8256
GRAND CLEMENT A M 7790
GRANDJEAN J 7978
GRANDSTAFF N 8239
GRECO V 7520
GREELEY S A 7522
GREEN W D 8CC9
GREENBERG R I 8151
GREGORY C J 7524
7523
GREKEL H 7525
GRENIER M R 7526
GRENNARD A H 7527
7350
GRIM K E 7820
GRIMLEY K W JR 7873
GRIMM H 7481
GRIMSLEY R L 7496
GRINDROD J 7528
GROTH W 8119
GROULX P R 7990
GRUBER C W 7821
GRUTSCH J F 7622
GUDERIAN R 8331
GUIOCHON G 7811
GUNTHER A 7680
GUSTAFSON P F 7785
GUTHMANN K 7529
GYAKUSHI N 7822

HAALAND S M 8433
HAAS J M 7351
HAAS M 7570
HABERL J B 7823
HACDAD L 7862
HAENISCH E 7530
HAENSEL V 7531
HAGER R N 7969
HAIJIMA K 8096
HAINES A E 7982
HAINES A 7983
HAINES G F JR 7829
HALL F F JR 7824
HALL H J 7533
7532
HALL J W 7384
HALL M A 8332
HALL T K 8211
8210
HAMANABE Y 7329
HAMAUZU Y 78C2
HAMELIN R A 7473
HAMILL P V V 8257
HAMMING W J 7368
HAN S T 77C6
HANAKAWA T 7543
HANDA T 7868
HANEL R A 79C7
HANGEBRAUCK R P 7534
HANIG G 7616
HANKS T G 8258
HANSELL W A 8420
HANSEN J E 8C34
HANSON V W 7412
7411
HAPPEL J 8152
HARA H 7535
HARADA A 7984
HARADA K 7944
HARADA K (CONT'D) 7942
HARADA M 8341
834C
8339
HARIMA H 7919
HARIMA S 78C2
7329
HARRELL J W 7536
HARRIS R L JR 7352
HARROP J A 77C9
HARSTAD J B 8153
HARTKAMP H 8154
HARTWIG J 7713
HASEGAWA K 7827
HASEGAWA Y 7846
HASEGAWA T 7826
7825
HASHIGUCHI K 7353
HASHIMOTO K 7537
HASHIMOTO M 8380
HASKIN L A 8028
HATTORI D M 7785
HATTORI H 8096
HAUGEN G R 8155
HAUT H V 8333
HAVIGHURST C C 8421
HAYASHI M 8096
HAYASHIDA K 7940
HAYASHINO M 7930
HAYNIE F H 8362
8361
HAZARD H R 7421
HEADLEY L C 8156
HEATON W B 7828
HEDDON M W 7368
HEICKLEN J P 8151
HEIMLICH B N 7742
HEINEN C M 7497
HEINIG P 8280
HEINSOHN R J 8157
HEMEON W C L 7829
HENDERSON J S 7830
HENDRICKSON E R 7538
7539
HENKE J 7540
HERNERYD F O 7611
HERROLD K M 8259
HERRON J T 8035
HERSHAFT A 8452
HESS L D 8110
HESS T L 7403
HESS W M 74C1
HEWSON G W 7541
HIBBARD R H 7857
HILLIARD R K 7542
HIMMELBLAU C M 8225
HINO M 8036
HINZ I 8249
HIRAKAWA H 7343
HIRAO O 7354
HIRAO S 7825
HIRAOKA M 7543
HIRAYAMA H 7887
HIRAYAMA K 8187
HISAMATSU Y 8368
HISE E C 8433
HISHIDA K 7544
HITOSUGI M 8260
HOBDELL M R 8158
HOCHHEISER S 7831
HOCHREITER F C 7832
HOCKIN L E 8422
HODGES G H 8343
HODGESON J A 7834
7833
HODGKINS D J 7348
HODGSON F N 7379
HODGSON T A JR 8261

HOEFIG R 7545
HOFFMAN G A 7546
HOFFMAN P E 7950
HOIDALE G B 7985
HOLLAENDER A 8433
HOLLANDER F H 8167
HOLLANDER B R 8167
HOLMAN G E 7484
HOLMQUIST E 8408
HOLTZMAN R B 8262
HOMMA M 8037
HONDA A 7365
HONMA K 7835
HONMA T 8038
HOOPER R P 7547
HOPP H H 8334
HORBERT M 8044
HORIUCHI K 8039
HORNSTEIN I 8159
HORRES C R JR 7873
HORTON A D 7986
HORVATH H 8040
HORVATH Z 8160
HOSKO M J 8263
HOTCHKISS H T JR 8108
HOTTEL H C 7800
HOUSE W T 7404
HOUSER E A 7836
HOWARD W H 7548
HUIE R E 8035
HUITT H A 7859
HULS T A 7355
HUMBERT K E JR 7549
HUNT J W 7550
HUNT W F JR 7837
HUNTER J E 7551
HURN R W 7485
HUSHEN W T 8153
HUSMANN K 7616
HWANG J Y 7838
HYATT E C 7813
HYMAN M H 7839

IACHETTA F A 7840
ICHIHARA K 7552
ICHICKA M 8264
IDE H M 7829
IIJIMA K 7718
IIJIMA N 8446
IIJIMA T 7729
IIKURA O Y 8265
IINOYA K 7553
7583
IKAWA H 8187
IKEDA H 7721
ILCEWICZ F H 8262
IMAI K 8041
IMAI M 8267
8253
8320
8266
IMAI N 8268
IMANURA T 7553
IMASE W 7944
INABA T 8161
7554
INGENITO F E 8269
INOUE A 7573
INOUE E 7841
INOUE K 8042
7556
INOUE O 7553
INOUE R 8043
INTEZAROVA E I 8107
IONESCU A 8235
IPSEN J 8269
IRELAND F E 8423
ISHIDA S 7940
ISHIGURO T 7896
7719
ISHIHARA Y 7650
ISHIKAWA Y 7385
8082
ISHINISHI N 8300
ISHINISHI S 8299
8301
ISHINISHI N 7382
ISOMURA T 8442
ISRAEL H 8044
ITO H 7365
ITO K 8212
ITO M 7996
ITO N 7620
ITO S 7902
7879
ITOH S 7718
IWASHIMA K 7511
IWATA Y 7557
IXFELD H 8002

JACKSON A 7757
JACKSON P J 7842
JACKSON R G 7558
JACOBI W 7778
JACQUEMAIN R 7987
JAEGER W 7498
JAFFE L S 7356
JAKOPLIC R 7532
JAMISON R M 7411
7657
JANATA J 7970
JARMAN R T 8045
JARRY R L 7570
JAYLES C 8106
JENNESS L C 7559

JENSEN D A 8396
JENSEN R A 81CC
JESIONEK B 7560
JINGUJI S 7992
JO K 8265
JOERGENSEN S E 7561
JOHANN I 7905
JOHNSON A N 8342
JOHNSON J E 7968
JOHNSON J H 7843
JOHNSON J S 8433
JOHNSTON H S 8162
8C46
JOHNSTON J W JR 81C3
JOHNSTONE H F 8047
7563
7562
7567
7569
7568
7566
7565
7564
7357
JONES A L 7679
JONES L R 7844
JONES M E 8048
JONKE A A 7570
JORDAN C W 7746
JORDAN I 8119
JOTANI F 7358
JOYCE R S 7571
JUCHAU M R 8286
JUENTGEN H 7588
JUENTGET H 7359
JUNG R 7845
JUNGE C E 8049
8027

KADO S 8369
KADOTA M 8041
KAISER E R 7572
KALLEND A S 8163
KALOPISSIS G 8233
KAMBE H 7846
KAMIEN M I 8376
KAMINIR L B 7776
KAMINO Y 7573
KAMIOKA Y 7574
KAMIYAMA H 7846
KANABROCKI E L 7785
KANAMORI S 7847
KANAZAWA K 7919
KANEDA K 7898
KANITZ S 8290
KANNO K 7360
KAPANCI Y 8246
KARPATI J 7575
KASAOKA S 8164
KATAYAMA H 7653
KATELL S 8382
KATO E 7729
KATO T 7848
KATO Y 7576
KATORI Y 7382
8301
83C0
KATZ M 8050
KAUFMAN A 7698
KAWA A 8270
KAWADA K 7943
KAWADA N 7361
KAWAGUCHI T 7848
KAWAMURA Y 7573
KAWAZOE K 7577
KAY K 8453
KEENAN R L 8295
KEFFER J F 8C51

KEHOE R A 8271
KELLER E 7578
KELLER J L 7579
KEMPNER S K 7580
KENDRICK J B JR 8344
KENNAN G F 8426
KERENYI D 7362
KETOV A N 7581
KEYER N P 8195
KEYES D B 7566
KHAN A R 7582
KHAN A U 8074
KHOKHLOVA T P 8195
KHVOSTEN KOV S I 8116
KIFUNE I 79C0
KIKUCHI I 7363
7387
KILLIAN C R 7442
KIMURA H 8167
KIMURA N 7583
KINCHEN J C 7963
KINDINGER J I 8346
KINERSON R 8C31
KING W H 7929
KINSELLA G E 7926
KIRK M M 8383
KISHKINOVA T S 80C0
KITA H 8264
KITABATA M 8267
KITABAYASHI K 8C96
KITAEV A T 7852
KITAMURA H 8089
8212
8088
KITRILAKIS S S 7636
KITTNER Z 8454
KIYOURA R 8443
7584
KLAPPENBACH E W 8032

KLEEMENKO A P 8165
KLEIN H 7585
KLEIN L 7683
KLEINSCHMIDT R V 7569
KLEJNOT D J 7818
KLEMPT W 7519
KLIMECEK R 7586
KLINE J R 7785
KNAPP L L 7587
KNEESE A V 8412
KNOBLAUCH K 7588
KNOP W 7364
KOBAYAKAWA T 8397
KOBAYASHI S 7930
KOCHETKOVA T A 8273
KODAMA Y 8299
7382
KOEPKE F W JR 7412
KOGO T 7343
8444
KOHGO T 7981
KOJIMA E S 7551
KOLBE W 8119
KOLGANOV V A 7589
KOMAZAWA T 8318
KONASHENOK V N 8166
KONDO K 7365
KONDO N 7992
KONDRATIEV V N 8107
KONNO A 7590
KONNO K 7591
7849
KONO K 7554
8161
KOOGLER J B 7539
7538
KOPA R D 8167
KOPCZYNSKI S L 8010
8118
KORDES E 8168
KORITSKII A T 8232
KOS V M 8169
KOSHI S 7850
KOSTKO O K 7851
KOTAKA S 8335
KOTB A K 7592
KOTIN P 8139
KOVAR N S 8170
KOYAMA O 7896
7719
KOYAMA Y 7930
KRAMER C L 8347
KRASNA A I 8171
KRASNOFF E L 8070
KRASNOPOL SKII A A 7406
KRASOVITSKII Y V 7494
KRASOVITSKAYA K A 7494
KRESSLEY L J 7509
KRICHEVTSOV E A 7852
KRISTAL E 7474
KRONSEDER J G 8384
KROTOSZYNSKI B K 7803
KRUEGER A P 8335
8272
KRUPKA F J 7926
KRZIKALLA H 8190
KUBO S 7962
KUCHERSKY R A 8273
KUCINSKIS L L 8184
KUCZYNSKI W 8172
KUKURUZNYAK I S 7852
KULKARNI R N 7988
KULPERGER R J 7693
KUMAZAWA Y 7825
7853
KUMMER J T 7749
KUNITAKE E 7382
8301
KUNITAKE E (CONT'D) 8300
8299
KURAMOTO M 7871
KURENBIN O I 8013
KURTZWEG J A 8418
KUSUMOTO M 7953
KUWATA S 7886
7885
KUZ MINYKH I N 7593
KUZNETSOV I E 7512
LA TOWSKY L W 8276
LABLANS W N 8052
LACASSE N L 8390
LACEY W A 7607
LACQUANITI A 7882
LAFAY F 7854
LAGERWERFF J V 8336
LAMB H H 7366
LAND G W 7594
LANDSBERG H 8053
LANG H W 7595
LANG L 7596
7597
LANGHOFF J 7598
LARIKOV V V 7581
LARKIN R L 7914
LARSEN G H 7445
LARSON R H 7599
LASETER J L 7401
LAUFHUETTE D W 7855
LAUTMAN D A 7804
LAVILLEON P D 7600
LAWRENCE R W 7816
LEAVITT R 8285
LEBEDEV Y S 8232
LEBOWITZ M 8311
LEDERMAN S 7967

LEFTWICH C I 8282
LEHRER A 7602
7601
LEIBOVICH R E 7603
LEIGH J H 7604
LEIGHTON P A 8054
LEIKIN L I 7512
LEONE I A 8325
LEPPER G H 7507
LEPSOE R 7605
7606
LESTZ S S 7973
LEVAGGI D A 7856
LEVEY S 8173
LEVIN L M 8222
LEVY A 8174
LEWIS G N 7607
LIBERATORE A J 7712
LIEBERT C H 7857
LIN J W 7980
LIN J W P 8141
LINCH A L 7820
LINCOLN B H 7608
LINDBLAD A R 7611
7610
7609
7613
7612
LINDEROTH C E 7542
LINDSEY A J 7989
LINNA E W 7594
LINSKY B 8385
LIU B 8224
LIU B Y H 7965
7964
7966
8175
LIVERMAN J L 8433
LLEWELLYN P M 7858
LLOYD G A 8455
LLOYD S J 8176
LOCKLIN C W 7421
LODGE J P JR 7859
LOEHNER K 7614
LOFTHEIM T B 7615
LOHS K 8456
LONGO L D 8274
LONNEMAN W A 8010
LOTTS A L 8433
LOWICKI N 7616
LUCAS H F JR 8262
LUCKERS J 7860
LUDWIG F L 8055
LUDWIG G 7617
LUDWIG J H 7618
7367
LUKACS J 8457
LUKMANOVA T L 8177
LUNDBERG L A 7662
LUNEV N K 8178
LUTZ G J 7861
LYBEN R G 7619
MACDONALD J C 7862
MACDONALD W E 8275
MACEY H H 8056
MACFARLANE J J 8179
MACPHERSON H G 8433
MACQUIDDY E L 8276
8312
MACVEAN S S 7863
MADELAINE G 8224
MADER P P 7368
MAEDA I 7620
MAENO M 8337
MAGE C T 7864
MAGNO P J 7990
8001
MAIER C G 7621
MAJER J R 7865
MAJERNIK O 8338
MAKHON KO E P 8025
MAKIHARA M 7962
MAKINO K 7553
MALLATT R C 7622
MALLEA M 7791
MALORNY G 8255
8254
MANAKIN G A 7735
MANGANELLI R M 7524
MANIER G 7623
MANO S H 7871
7870
MANSFIELD T A 8338
MANTIS H T 7866
MARECEK J 7420
MARIER J R 8277
MARKANT H P 7631
MARKS A M 7624
MARQUARDT W 7369
MARRUCCI G 7518
MARSH J D F 7625
MARSH W W JR 7351
MARSHALL B S 7867
MARTENEY P J 7370
MARTENS H 7626
MARUCCI V 8237
MASEK V 7371
MASSEY L G 7734
7732
MASSEY P S 7627
MASUKO N 8368
MATHE G 7575
MATSKANOVA M A 7956
MATSUDA N 7628

MATSUDA S 8088
7974
MATSUMOTO Y 7981
MATSUMOTO K 7629
MATSUMURA T 8008
MATSUNO Y 7543
MATSUSHIMA J 8339
8341
8340
MATSUSHITA Y 8088
MATSUSHITA H 7868
7869
MATSUURA U 8278
MATTESON J H 7384
MATTHEWS C 7961
MATTIA M M 8460
MATVEEV K I 8137
MAUDIT Y D 8180
MAYRSOHN H 7871
7870
MC CARROLL J 8311
MCCARTHY J L 8196
7662
MCCONNAUGHEY P W 7630
MCCONNELL F J 7971
MCCOOL M M 8342
MCCORMACK J D 7542
MCCORMICK R A 8057
MCCUNE D C 8357
MCDANIEL W R 8058
MCDOWELL L L 8327
MCELROY F 7872
MCFARLAND R A 8279
MCGEE J P 7712
MCGINNITY J L 7873
MCGUIRE T 7991
MCILROY R A 7631
MCMANUS T T 8285
8284
MCMILLAN R E 7788
7348
MEAD J 7787
8298
MEAD J M 8059
MEDCALF W A 7632
MEETHAM A R 8060
MELFI S H 7874
MELHUS J 7633
MELLENTHIN W M 8326
8327
MENDOZA A P D 8427
MENSER H A 8343
MERRIAM H F 7634
MERRYMAN E L 8174
MESZAROS E 8061
MEYER A S 7986
MEYER J A 8181
8182
MEYER W E 7973
MEYSSON N 7875
MICHAELS A 7522
MIDDLETON J T 7373
8344
MIKHAILOVA I L 8195
MIKULKA P 8280
MIL SHENKO R S 7494
MILBOURNE C G 7746
MILLER A 8139
8062
MILLER K W 8105
MINOWA T 8064
MION J 7876
MISHIMA H 7940
MISHIMA M 7511
7899
MITCHELL R F 7605
MITINA L S 8281
MITTRA R 7938
MIURA T 7329
7919
MIYACHI K 8253
MIYAJI M 7573
MIYATA K 8321
MIZOGUCHI T 7890
MIZUNO T 7952
MOCEK K 7420
MOFFAT A J 7877
MOGI M 8096
MOGI T 8318
7992
MOLISKEY A 7635
MOLODOV A M 7993
MONTAGU H E 7501
MOODY J W 7421
MOORE W 7878
MOORE, C E 7785
MORGAN D T 7636
MORGAN G B 8428
MORI M 7879
MORIGUCHI M 8080
8079
MORITA Y 8219
MOROZ W J 7880
MORRISON W H III 8211
8210
MORTON B R 8065
MOSER E 8345
MOSER F 7908
MOSES H 8066
8021
MOSIER B 7881
MOSS R L 8364
MOTLEY H L 8282
MOULTON D G 8283
MOZAN, C 7882
MUDD J P 8285
8284

MUHLRAD W 7637
MUKAI M 7946
MUKHIN A A 7494
MUKHLENOV I P 75C2
MULIK J C 7883
7873
MULLEN J O 8286
MUNAKATA Z 7848
MUNCACI E 8235
MURANAKA H 7721
MURANO J 8265
MURAO H 8164
MUROZUMI M 7374
MURPHY W A 757C
MUSGRAVE B C 7983
MUTSUO K 787C
MYERS A L 8138
MYERS G H 8183
MYERS P S 7638

NAGEL R L 8184
NAGLE C M 8083
NAKAAKI K 83C8
7884
NAKAGAWA F 7886
7885
NAKAJIMA F 7640
NAKAJIMA S 7639
NAKAJIMA M 8265
NAKAJIMA S 8043
NAKAMURA H 8317
NAKAMURA K 7887
NAKAMURA T 7761
NAKANO S 7975
NAKASA H 7888
NAKAYAMA M 7643
NALINIMOHAN RAC M 79C9
NAMIKI T 7329
7919
NANN E 8119
NARDONE L J 7804
NELSON D M 7785
8C2C
NELSON L Y 8185
NEMTSEVA L I 80C0
NEUHAUS W 7889
NEWBURY B C 7994
NEWHALL H K 7641
NEWLING W B S 7625
NEWMAN L 8158
NICKOL H A 7355
NICOLE P P 8188
NISHIDA K 7642
7385
NISHIGUCHI K 8321
NISHIHARA M 8431
NISHIMOTO Y 8318
NISIMOTO K 7822
NISKANEN E 8363
NOBLE B F 7485
NOBUKUNI T 7643
NOGAMI J 7890
NOGAMI Y 7853
NOGHREY J 7864
NOLL K E 7891
7991
NONHEBEL G 7644
NORMAN W S 7645
NORTH R M 8386
NORTON R B 8C67
NOSO S 7646
NOVAK J 8400
NOVOTNY P 7647
NOYES W A JR 8186
NUZUM H K 7648
O DONNELL A 7803
O DONNELL R 8280
O KEEFE A E 7892
O KEEFFE A E 7893
7924
O NEAL H E 8111
O NEAL J D 7894
O NEILL D 7649
OBATA K 7886
OCA K 7650
7353
ODA Y 8219
ODA, K 7952
OELS H 8432
OELSHLAEGER W 8345
OESEBURG F 7895
OESTMANN M J 7340
OETTINGEN W F V 8288
OGAWA Y 8C43
8068
OGDEN E C 7910
7911
OGINO H 7879
OHIRA T 7896
OHMICHI S 7995
OHTAKI A 7932
OHTSUKA T 7652
OIKAWA K 7897
OKA M 7375
OKEEFFE A E 7936
OKITA T 7900
7653
7899
7898
OKUDA N 7901
OKUNO T 7974
OLIVER T C 7654
OLSSON L E 8024
OMICHI S 7996

CMORI K 8317
CNGUN A 8285
CNICHI S 79C2
CNIZAWA S 7573
CNO H 7888
CPEKAR P C 7655
CRDIN L 8332
8346
CRTMAN G C 7936
CRTUNO A V 7656
CSHIMA H 8289
8321
8231
8267
8320
8253
8266
8319
CSHIO T 8401
CTA Y 8069
OTSUKA S 8187
OUTIN M M J 7473
OWADA T 8041
OYAKE T 8444
7343
OZIMEK R T 7376
OZOLINS G 8428
8418

PADY S M 8347
PANOF S 7779
PANOV V P 8214
PANZICA N J 7412
7411
7657
PARADIS 7330
PARKER J 7903
PARKISON R V 7659
7658
PARMET I 8124
PARSON D 7660
PASHANOVA A P 8CC0
PATE J B 7859
PATTERSON C 7374
PATTON R A 7661
PAULUS H J 8247
PEARSON C A 7662
PEARSON J L 7644
PECHKOVSKIY V V 7581
PELECIER C P R 7473
PERDON H 7377
PEROTIN J P 7663
PERRY H 7664
7378
PERSON J C 8188
PESKIN R L 8C70
PETERS G A 7474
PETERS J 8142
PETERSON J T 8C71
8072
PETERSON N 7787
PETERSON G 7498
PETRENCHUK O P 8C73
PETRILLI F L 829C
PETTINATI L 7882
PFETSCH U 7904
PHILLIPS C J 7759
PHILLIPS J R 8295
PICH J 8189
7665
PIEKAAR H W 7461
PIERCE C I 8156
PIERCE J O 7933
PIGFORD R L 8227
PIKE G F 7454
PILZ W 7905
PITTS J N JR 8074
8101
8163
8110
PIVOVAROVA Z I 7997
PLAKS N 7666
PLANTS K D 8382
PLATO H 7667
PLEBAN E J 7668
PLUMMER A W 8130
POETZL K 7904
POLLACK J B 8034
POPE D 8364
POPOV B V 8348
POPOV D M 7593
POPOV V A 8402
PORTER M A 7432
PORTS K N 7403
POSTMA A K 7542
POTTER L 7949
POUDRAI M 79C6
POWELL A R 7669
POZIN M E 8214
PRABHAKARA C 7907
PRATTE B D 8075
PREINING O 7908
PREZIOSI 8291
PROCTOR R C 7670
PROELSS H F 8228
PRZEMECK E 835C
PUESCHEL R F 8022
PUNINA V A 8197
PUSTINGER J V JR 7379
PUTNAM A A 7421

RABENHORST D W 7671
RACHOVSKAYA L N 8137
RADOMSKI J L 7399

RADUSHKEVICH L V 7589
RAMANA MURTY Y V 7909
RANNEY H M 8184
RASCHEWSKI L 8459
RASMUSSEN R A 7380
RAY A M 8292
RAYNOR G S 7911
7910
7913
7912
READ H J 7567
REES R L 7541
REGEHR U 7672
REHME K A 7925
REICHARD F 7651
REICHEL H 7673
7674
REID W T 8174
REIF J S 8293
8294
REILLY D W 7926
REINKING W F 8427
REKHTER V Y 7852
REMILLEUX J 7637
REMILLIEUX J 7675
REMMERT L F 8326
8327
REMY BILLON M C 7987
REMY F 7987
RENAULT P 7676
REPPE W 8190
RESNICK I 8387
REYERSON L H 7677
REYNOLDS P J 7842
RHODES W H 8293
RICH S 8349
RICKLES R N 7678
RIEDEL J 7545
RIENAECKER G 8191
RIGHTMIRE R A 7679
RISSMANN E F 7914
RITCHER P O 8327
RITTENBERG D 8171
ROACH C G 7950
ROBBINS R C 7998
ROBERSON J E 7539
7538
ROBERTS E S 7680
ROBERTS L M 7486
ROBERTSON D L 7466
ROBERTSON S L 8192
ROBINS D L 8460
ROBINSON E 8055
ROBINSON M 7533
ROBINSON E 7998
ROCKWELL T H 8292
RODES C E 7915
RODKEY F L 7894
7916
ROESNER G 7726
ROGACKI C A 7680
ROGINSKII S Z 8201
ROKAW S N 8295
ROKUSHIKA T 7381
ROLL K H 7681
ROMELL D 7682
RONCHI G U 8237
RONCO R J 7814
ROSE D J 8433
ROSEN J M 8077
7917
ROSENBERG E 7924
7925
ROSENSTEIN L 7683
7685
7684
ROSSANO A T 8457
ROTHERAM M A 7918
ROUGHTON F J W 8296
ROUNDY R W 7950
ROUSE H 8100
ROUSSILHE A 8434
ROWLANDS R P 8367
RUBIN M 8103
RUDINSKY J A 8327
RUEGG R 7686
RUIZ DE ANDRES S 8297
RUMSEY D W 8404
RUSOV M T 8178
RUSSELL E J 8193
RYCERSKA LAZECKA H 8359

SABADELL A J 7814
SAFE W 8360
SAIBENE F 8298
SAKAI G 7689
SAKUMA K 7919
SAKURABA 7922
SAKURABA S 8078
8079
SAKURANIWA S 8461
8080
SALMON R L 8365
SALTZMAN B E 7920
SAMPLES R H 7690
SANBORN E N 7946
SANDULACHE L 8235
SANJOUR W 8417
SANO I 8194
SARKISOV S L 7921
SARSHAD A A 7454
SARUTA N 7382
8300
8301
8299

SASAKI H 8321
8231
SASAOKA E 8164
SATO A 8003
SATO J 7922
8461
SATO S 7387
7363
SAWAYA T 7383
SAWHILL R B 7384
SAWYER W K 8156
SAYLOR C P 7923
SAZONOVA I S 8195
SCARBERRY J E 7963
SCARINGELLI F P 7925
7924
SCHAEFER V J 8081
SCHAFFER R J 8366
SCHEFFER F 8350
SCHIAGER K J 7926
SCHIERECK F C 7462
SCHIKARSKI W 7927
SCHMIDT A F 7434
SCHNUERPEL W 7713
SCHOFFSTOLL C B 7570
SCHOOFS R J 7693
SCHREITER W 7369
SCHROEDER M 7530
SCHROEDER W H 8091
SCHUMANN C E 7821
SCHWALM H W 8344
SCOGGINS M W 7928
SCOLLON T R 8388
SCOTT W D 8196
SEARL T D 7929
SEARS J T 7702
SECHLER D 8351
SEDLAK J 7371
SEDOR P 7413
SEEGER H 7694
SEGRETAIN G 7791
SEIDL W 8435
SEILER E N 7580
SEILER R R 7695
SEKI T 7952
SELEZNEVA E S 8073
SEMENOV A D 8000
SEMERJIAN H 7798
SEMONIN R G 7938
SEMRAU K 7696
SENSENBAUGH J D 7697
SETSER D W 8182
8181
8207
SETZER H J 7698
SHABAD L M 8302
SHAPOVAL G L 7852
SHELEST V P 7603
SHELKOV S K 7603
SHERWOOD T K 7699
SHIBATA Y 7718
SHIDARA M 8436
SHIFRIN K S 8197
SHIGENO K 7700
SHIGETA F 7899
SHIGETA Y 7802
7930
SHIKIYA J 7931
SHIMIZU M 7992
SHIMODA O 7652
7952
SHIOMI H 8321
SHIOZAWA K 7932
SHIRAISHI Y 7629
SHIRAKAWA H 8444
SHIRAKI T 7975
SHIRASAWA T 7944
SHIRINKIN N A 7852
SHITASAWA T 7942
SHLEIEN B 8001
SHLIFER V A 7512
SHLIGERSKIY A S 7581
SHOEMYEN J 8352
SHOJI H 8082
7385
SHOKIN I N 8150
SHOUP A J 7482
SHUB B R 8201
SHVEDOV S V 7921
SIENICKI E J 7843
SILVERMAN L 7474
SIMARD A J 8198
SIMECEK A 8199
SIMONS H E 7622
SIMPSON M H 8200
SINCLAIR W A 8353
SINGER I A 8083
SINGH A D 7563
7568
SINK M V 7497
SIPPEL A J III 7595
SITNITSKIY Y I 8169
SJOSTRAND T 8303
SKLENSKY B 8304
SKLYAROV A V 8201
SKOPP A 7702
SLEVA S F 8102
SMART R H 8282
SMITH B S 7933
SMITH D S 7386
SMITH E B 8074
8105
SMITH N 8193
SMITH P S 7703
SMITH R P 8202
SMITH R W 7340
SMITH S M 7985

SNOW R D 7704
SOLER M 7791
SOLLY R K 8204
8203
SOLOMON W R 8305
SONE H 7363
7387
SONODA K 8446
SOPHER R L 8246
SOTHERN R 7871
7870
SPAETH A 8190
SPAITE P W 7705
7534
SPALDING C W 7706
SPALL B C 8205
SPECHT A W 8336
SPEDDING D J 8367
SPURNY K 7934
STAHL Q R 7388
7390
7389
STAL MAKHOVS I P 8206
STAROSEL SKII Y I 7735
STAYNER R A 7478
STEDMAN D H 8207
8208
8182
8181
STEIN F 7935
STEINBERG R A 7332
STEINBERG M 8209
STEINHAGEN W K 7708
STENHOUSE J I T 7709
STEPANOV G V 7921
STEPHENSON J W 7391
STEUERNAGEL W 7489
STEVENS R K 7936
7937
STICKINGS B J 8105
STICKLE J W 7874
STIGLIANI D J JR 7938
STOCKS D L 7401
STOCKTON E L 7939
STONE R 7392
STORY P R 8210
8211
STORY R V 8271
STRACK W C 7711
STRATMANN H 8002
8405
STREET R K 7690
STREETE J L 8012
STRIMBECK D C 7712
STROBEL J E 7379
STUPFEL M 8306
SUDA S 7447
SUGAI R 7900
SUGAOI R 7898
SUGAWARA K 8096
SUGAWARA N 7981
SUGINO K 7652
SUGITA I 7353
SUGIYAMA H 7886
7885
SUITO E 7940
SULLIVAN R J 7395
7394
SULLIVAN J L 7393
SUNDGREN-WALLDEN R S M 7744
SUPP A 7713
SURKOV Y I 8150
SUTTERFIELD F C 8010
SUTTON O G 8084
SUZDAL TSEV V D 7406
SUZUKI A 7868
SUZUKI I 8368
SUZUKI M 8037
SUZUKI S 8086
8085
SUZUKI T 7714
7511
SVERDLOV L M 8206
SVETLOVA A K 8307
SWANN H E JR 8295
SWANSON J L 7804
SWEARINGEN L E 7077
SYDBERGER T 8370
SYOJI H 8445
SZOMBATHY K V 7716
TADA O 7941
7396
8308
TAIRAFUNE K 8003
TAJIRI T 7942
TAKABAYASHI Y 8087
TAKADA N 8088
8089
TAKAGI S F 8212
TAKAHASHI M 8003
TAKAHASHI S 7717
TAKAHASHI T 7848
TAKAMATSU B 7943
TAKAOKA H 7718
TAKASAKI T 8309
TAKATSUKA Y 8321
8319
8267
8231
TAKEDA M 7896
7719
TAKEDA O 8164
TAKEUCHI T 7720
TAKIJIMA T 7387

TAMAN S 7721
TAMORI I 7944
7942
TAMORI Y 7764
TANAKA H 7974
TANAKA K 7652
TANAKA R 7353
TANAKA T 7720
TANIZAKI A 8317
TARALA F E 7722
TAVARTKILADZE K A 8C9C
TAYLOR H D 7945
TAYLOR R P 8213
TAZAWA S 7962
TAZIRI A 7944
TEBBENS B C 7946
TERANISHI R 8159
TERESHCHENKO L Y 8214
TEWORTE W 7723
THELEN J 8215
THEODORE J 8280
THOMAS D G 8216
THOMAS J F 7946
THOMAS M D 831C
THOMAS W J 8217
THOMPSON D J 8311
THOMPSON A P 7429
7428
THOMPSON J L 7725
THUMAN W C 8462
THUMM W 7726
TIKVART J A 8394
TILLY G P 8360
TIMARU J 8235
TODOROKI R 8369
TOELLE J 7331
TOKIDA T 8194
TOKIWA Y 7949
78C8
TOKIWA Y (CONT'D) 7948
TOLIVER W H 7950
TOLLMAN J P 8276
8312
TOMAIDES M 7397
TOMISAWA M 7951
TOMITA Y 8265
TOMIZAWA T 7952
TOMLINSON H 8349
TOMOGAMA T 7727
TOOR H L 7332
TORRENTS L M 8218
TOWSKY L W L 8312
TOYAMA T 7953
TRAIN D 8437
TRET YAKOV I I 8201
TROMMSDORFF W 8215
TRUCHON 7330
TSUCHIDA K 7995
TSUCHIDA T 7721
TSUCHIMOTO K 8219
TSUDO K 7728
TSUJI M 7974
TSUJI S 7729
TSUKAYA T 8082
TSUNODA H 8313
TULLOCK G 8389
TURK A 7730
TURPIN 7330
TYRER D 7731
UEDA K 7954
UENO Y 8194
UI J 8446
UMBRICHT E 7657
7411
UMEDA H 8089
UMSTEAD M E 7968
UNO H 7995
UPHAM J B 8361
URBAN P 7732
7733
7734
8091
UYEHARA C A 7638
VALENZUELA J M 8198
VAN DER STRICHT E 7784
VAN HEEK K H 7359
VANAG G 7955
VANAG G Y 7956
VANCURA J 8438
VANNERBERG N G 8370
VARLAMOV M L 7735
VASAK V 84C0
VERESS S A 7957
VETTER H 7958
7737
VETTIG K 7959
VICKERS R S 8220
VIDOMENKO A N 7333
VIL NYANSKIY Y Y 8177
VILES P S 7738
VOGEL H 7739
VOGEL W 8168
VOGL M 8354
VOIGT D 8221
VOLK F 7726
VOLK R 8314
VOLOSHCHUK V M 8222
VOMELA R A 8223
VON LEHMDEN D J 8439
VOTRUBA R J 7980
WACHAL A L 7960

WADDELL T E 8371
WAGGONER P E 8349
WAGMAN J 8005
WAID D E 7740
WAJSFELNER R 8224
WALDEN E L 7842
WALDENSTROEM T 7875
WALKER B 7741
WALLACE T J 7742
WALLDEN R S M 7743
WALLDEN S J 7743
7744
WALLIN O W JR 7745
WALLING J F 7648
WALLIS G B 7863
WALSH G W 8439
WALTERS J G 7756
WALTERSCHEID E C 7398
WANG J C 8225
WANNER H U 8006
WARD A L 7746
WARD W J III 7747
WARNECK P 7961
8133
WASSERBERGER J 7399
WATANABE Y 8092
WATANABE M 7962
WATANABE J 7590
WATANABE A 7761
WAYNE R P 8074
WEAVER L 8142
WEBB J C 7963
WEBER D J 7401
WEBER E 7400
8093
WEBER N 7749
WEBER R J 7750
WEBSTER C C 8355
WEEKS T J 7751
WEETE J D 7401
WEIBEL E R 8246
WEIDENSALL T C 8390
WEIGL J 8356
WEIL E D 7752
WEILL H 8315
WEINSTEIN M 8226
WEINSTEIN L H 8357
WEISS G F 8132
WELGE K H 8119
WENTWORTH J T 7828
7402
WERDERER B 7663
WERNER K 7753
WEST F B 7662
WESTBERG K 8094
WEYANT W S 8007
WHITAKER S 8227
WHITBY K T 8223
8175
7965
7964
7966
7397
WHITE E W 7788
WHITMAN N E 7769
WIDHOPF G F 7967
WIEGAND H 8215
WIENER H A 7403
WILCOX H A 7754
WILD H 7927
WILDE C B 7755
WILEY R F 8228
WILL G 7529
WILLIAMS M B 7970
WILLIAMS F W 7968
WILLIAMS G C 7800
WILLIAMS D T 7969
WILLIAMSON E J 7907
WILMS W 8350
WILSDON B H 7971
WILSON D L 8010
WINDOM H J 8095
WINEFORDNER J D 7972
WINKLER G L 7973
WISE H 8230
WISNIESKI K 7787
WOLFSON C E 7756
WOLTER D 8311
WONG E L 8229
WONG S Y 8141
WOOD B J 8230
WOOD R 7867
WOOLLAM J P V 7757
WOOLLEY S H 7758
WRANAU G V 7759
WYATT J R 8110
WYSE G A 8212

YAGI Y 8082
YAMADA K 7869
YAMADA T 8096
YAMADA Y 7826
YAMAGA S 8317
YAMAGAMI Y 7760
YAMAJI I 8079
8080
YAMAMOTO N 7761
YAMAMOTO T 7974
YAMAMOTO H 7954
YAMAMOTO T 8082
YAMATE N 8008
YAMAUCHI H 7762
YAMAZAKI K 7992
8318
YAMAZOE F 8358

YANAGIHARA S 8097
YANAGISAWA S 7761
YANES K Y 7333
YANO S 7940
YASUDA K 7573
YASUKAWA H 8039
YATABE T 7652
YEMCHUK E M 7763
YOCOM J E 8440
YOKOYAMA N 8096
YORDANOV D 8099
YORDANOV D L 8098
YOSHIDA K 8321
8267
8319
8289
8253
8266
8407
8231
8320
YOSHII M 8253
YOSHIKAWA S 7975
YOSHIOKA N 7764
YOSHIOKA T 7885
YOUNG H T 7765
YPHANTIS D A 8132
YU H H S 8175
YURGENSON J A 7333

ZAHRADNIK R L 7332
ZAROMB S 7976
ZAWADZKI E A 7767
7766
ZAWADZKI J 8359
ZECK O F 7843
ZELINSKI J J 7804
ZENTGRAF K M 7768
ZIEGLER H 8356
ZILLES B A 8183
ZISKIND M M 8315
ZRAJEVSKY I M 8013
ZUBKOV A V 8232
ZUZUKI M 7902

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12201	12238	12253	12260	12268	12314	12345	12431	12490	16271	17274
17291	17295	17317	17320	17323	17430	17627	17628	17629	17630	17631
17632	17633	17634	17635	17636	17637	17638	17639	17640	17641	17719
17720	17721	17722	17723	17724	17725	17726	17727	17728	17729	17730
17731	17732	17733	17734	17735	17739	17745	17921	17952	19001	19002
19003	19004	19005	19006	19007	19008	19009	19010	19011	19012	19013
19014	19015	19016	19017	19018	19019	19020	19021	19022	19023	19024
19025	19026	19027	19028	19029	19030	19031	19032	19033	19034	19035
19036	19037	19038	19039	19040	19041	19042	19043	19044	19045	19046
19047	19048	19049	19050	19051	19052	19053	19054	19055	19056	19057
19058	19059	19060	19061	19062	19063	19064	19065	19066	19067	19068
19069	19070	19071	19072	19073	19074	19075	19076	19077	19078	19079
19080	19081	19082	19083	19084	19085	19086	19087	19088	19089	19090
19091	19092	19093	19094	19095	19096	19097	19098	19099	19100	19101
19102	19103	19104	19105	19106	19107	19108	19109	19110	19111	19112
19113	19114	19115	19116	19117	19118	19119	19120	19121	19122	19123
19124	19125	19126	19128	19129	19130	19131	19132	19133	19134	19135
19136	19137	19138	19139	19140	19141	19142	19143	19144	19145	19146
19147	19148	19149	19150	19151	19152	19153	19154	19155	19156	19157
19158	19159	19160	19161	19162	19163	19164	19165	19166	19167	19168
19169	19170	19171	19172	19173	19174	19175	19176	19178	19179	19180
19181	19182	19183	19184	19185	19186	19187	19188	19189	19190	19191
19192	19193	19194	19195	19197	19198	19199	19200	19201	19202	19203
19204	19206	19207	19208	19209	19210	19211	19212	19213	19214	19215

Continued on next page

19216	19217	19218	19219	19220	19221	19222	19223	19224	19225	19227
19228	19229	19230	19231	19232	19233	19234	19235	19236	19237	19238
19240	19241	19242	19243	19244	19245	19246	19247	19248	19249	19250
19251	19252	19253	19254	19255	19256	19257	19258	19259	19260	19261
19262	19263	19264	19265	19266	19267	19268	19269	19270	19271	19272
19273	19274	19275	19277	19278	19279	19280	19281	19282	19283	19284
19285	19286	19287	19288	19289	19290	19291	19292	19293	19294	19295
19296	19297	19298	19299	19300	19301	19302	19303	19304	19305	19306
19307	19308	19309	19310	19311	19312	19313	19314	19315	19316	19317
19318	19319	19320	19321	19322	19323	19324	19325	19326	19328	19329
19331	19332	19333	19334	19335	19336	19337	19338	19339	19340	19341
19342	19343	19344	19345	19346	19347	19348	19349	19350	19351	19352
19353	19354	19355	19356	19357	19358	19359	19360	19361	19362	19363
19364	19365	19366	19367	19368	19369	19370	19371	19372	19373	19374
19375	19376	19377	19378	19379	19380	19381	19382	19383	19384	19385
19386	19387	19388	19389	19390	19391	19392	19393	19394	19395	19396
19397	19398	19399	19400	19401	19402	19403	19404	19405	19406	19407
19408	19409	19410	19411	19412	19413	19414	19415	19416	19417	19418
19419	19420	19421	19422	19423	19424	19425	19426	19427	19428	19429
19430	19431	19432	19433	19434	19435	19436	19437	19438	19439	19440
19441	19442	19443	19444	19445	19446	19448	19449	19450	19451	19452
19453	19454	19455	19456	19457	19458	19459	19460	19461	19462	19463
19464	19465	19466	19467	19468	19469	19470	19471	19472	19473	19474
19475	19476	19477	19478	19479	19482	19483	19484	19485	19486	19487
19488	19489	19490	19491	19492	19493	19494	19495	19496	19497	19498
19499	19500	19501	19502	19503	19504	19505	19507	19508	19509	19510
19511	19512	19513	19514	19515	19516	19517	19518	19520	19521	19522

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19534	19535	19536	19537	19538	19539	19540	19541	19542	19543	19544
19545	19546	19547	19548	19549	19550	19551	19552	19553	19554	19555
19556	19557	19558	19559	19560	19561	19562	19563	19564	19565	19566
19567	19568	19569	19570	19571	19573	19574	19575	19576	19577	19578
19579	19580	19581	19582	19583	19584	19585	19586	19587	19588	19589
19590	19591	19592	19593	19594	19595	19597	19598	19599	19600	19601
19602	19603	19604	19605	19606	19607	19608	19609	19610	19611	19612
19613	19614	19615	19616	19617	19618	19619	19620	19621	19622	19623
19624	19625	19626	19627	19628	19629	19630	19631	19632	19633	19634
19635	19636	19637	19638	19639	19640	19641	19642	19643	19644	19645
19646	19684	19685	19686	19687	19689	19690	19691	19692	19693	19694
19695	19696	19697	19698	19699	19700	19701	19702	19704	19705	19706
19707	19708	19709	19710	19711	19712	19713	19714	19715	19716	19717
19718	19719	19720	19721	19808	19809	19810	19811	19812	19813	19814
19815	19816	19817	19818	19819	19820	19821	19822	19823	19824	19825
19826	19827	19828	19829	19830	19831	19832	19833	19899	19901	19902
19903	19904	19905	19906	19907	19908	19909	19910	19911	19912	19913
19914	19915	19916	19917	19918	19919	19920	19921	19922	19923	19924
19925	19926	19927	19928	19929	19930	19931	19932	19933	19934	19935
19936	20001	20004	20008	20009	20022	20046	20049	20076	20079	20095
20099	20104	20146	20149	20161	20167	20169	20171	20176	20194	20215
20236	20459	20460	20790	20791	20796	20803	20812	20820	20829	21643
21644	21645	21646	21647	21648	21649	21650	21651	21652	21653	21654
21655	21656	21657	21658	21659	21660	21661	21662	21663	21664	21665

Continued on next page

21666	21667	21668	21669	21670	21671	21711	21712	21713	21714	21715
21716	21717	21718	21719	21720	21721	21722	21723	21724	21725	21726
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21749	21750	21751	21752	21753	21754	21755	21756	21757	21758	21759
21760	21761	21762	21763	21764	21765	21766	21767	21768	21769	21770
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21805	21806	21807	21808	21809	21810	21811	21812	21813	21814	21815
21816	21817	21818	21819	21820	21821	21822	21823	21825	21826	21827
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21918	21919	21920	21921	21922	21923	21924	21925	21927	21928	21929
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21964	21965	21966	21967	21968	21969	21970	21971	21972	21973	21974
21975	21976	21977	21978	21979	21980	21981	21982	21983	21984	21985
21986	21987	21988	21989	21990	21991	21992	21993	21994	21996	21997
21998	21999	22000								

NAME_____ **DATE**_____

NAPCA PROGRAM_____

ADDRESS_____